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VIEWS, NEWS AND INTERVIEWS.

The new sewer in Paris, France, will be a most important work when it is finished, as it will be within the next few months, says a London exchange. It will take the affluents from most of the present sewers, and constitute the newest departure in main-drainage schemes. Its dimensions are 18 feet in height by 15 feet in breadth. Its present length is about a mile and three-quarters. The boring is being made on the same lines as those adopted for the Blackwall Tunnel and other similar undertakings in England. A moving shield is forced forward by electrically driven jacks into the space excavated by blasting or handwork, and the masonry is built up behind it. The débris is removed by electric and steam locomotives in miniature railway trucks. The progress is about 20 feet per day.

Director Rothen, of the International Telegraph Bureau at Berne, Switzerland, is dead.

Mr. Dengoro Ushioda, an electrical engineer from Tokyo, Japan, is visiting the United States to inspect the latest developments in electrical work. He is especially interested in electric railways, lighting and long-distance transmission, and will spend about six months in this country visiting the more important installations.

Since Mr. Edison made his experiments on the fluorescence of certain salts, and discovered that tungstate of calcium gave the best results in the fluoroscope, his chemists have been making chemical combinations not procurable elsewhere. Thirty new substances per day have been the average product. These have been subjected to the X ray and their fluorescing power measured. Mr. Edison has found one chemical which is more sensitive to the X ray than any heretofore known. He will keep on in his work, however, until there is little hope of finding anything better, although he says that the chances of discovery can never be exhausted, the possible chemical combinations running up into the hundreds of millions.

The following letter was recently printed in the New York *Sun*:

Will you publish the name of a man who is well up in electrical matters, who is able to invent and who would respect confidence; that is to say, a party to whom an idea might be given, and who, if the idea should prove to be practicable and he should utilize it, would deal fairly with the suggester? I have such an idea, and would like to turn it to account if possible. PRINTER-READER.

The Court of Appeals, in an opinion recently delivered at Frankfort, Ky., by Judge Guffy, against the Western Union, holds that telegraph companies are liable for damages for mistakes in unrepeated messages, notwithstanding the waiver of damages printed on the backs of the company's blanks.

Cost of Steam Railway Track in 1830.

In an old pamphlet which was discovered recently in the Astor Library, in New York, are some interesting figures with reference to the cost of a piece of track laid by the B. & O. Railroad in 1830 and 1831. I. L. Sullivan, evidently a civil engineer, in a report to R. L. Colt, estimates that the track laid with wood sleepers, wood bearers and plate rail, exclusive of ground and graduation, would cost $4,362 per mile; with stone blocks, wood bearers and plate rail, of which the cost of iron was $1,324, the cost would be $5,115 per mile; with granite sills in line with plate rail, of which the iron was $2,037, the cost would be $6,500 per mile, divided as follows:

Sills at $11.50 per 100	$3,680
Bar iron	1,300
Broken stone	640
Various items	880

This engineer speculated on two-ton loads and one-ton cars, and said in his report that the B. & O. would be doing a very rash thing if they went beyond this point.

He also says: "The locomotive engine now operating successfully on the Baltimore road, made by Mr. Winans to run on a friction carriage, though of moderate power, has a great useful effect."

Mr. Winans was apparently the first to patent outside journals and to reduce the resistance from friction from 11¾ to 4 pounds per ton.

On July 4, 1828, Charles Carroll, of Carrollton, the celebrated signer of the Declaration of Independence, laid the first stone on the B. & O. Railroad.

FIG. 1.—AN ELECTRIC COUPÉ.

Electric Carriages in New York City.

The Electric Carriage and Wagon Company have established headquarters in Thirty-ninth street, New York city, and soon expect to inaugurate an electric cab system in this city. We illustrate in this issue three of their vehicles, an electric hansom, electric surrey and electric coupé. The electric hansom is particularly popular with all who have tried it. The vehicle moves along noiselessly and without any jolting or jarring, the weight of the storage battery, amounting to about 800 pounds, proving an advantage in respect to steadiness of motion. Competent engineers take the places of the drivers, and we may soon expect to see this novel-looking vehicle in use in all parts of the city. At present they attract a good deal of attention and occasionally disturb the serenity of the milk-wagon horse or the antiquated street-car quadruped.

Referring to the illustrations on this and the following pages, Fig. 1 shows an electric coupé, Fig. 2 an electric surrey and Fig. 3 an electric hansom. The motors used on all the electric carriages manufactured by the Electric Carriage and Wagon Company are of the Lundell type, made by the Interior Conduit and Insulation Company, of New York city, and the batteries are the latest product of the progressive Electric Storage Battery Company, of Philadelphia.

The surrey illustrated in Fig. 2, on the next page, is a vehicle with a record. On Friday, September 11, 1896, this carriage, at the Narrgansett Park races, Providence, R. I., made the unprecedented time of 11 minutes and 27 seconds for a five-mile run, or at the rate of 26.2 miles per hour—average time per mile, 2.17—beating all other competitors and establishing the five-mile record for motor vehicles.

When it comes to that pass that an electric carriage makes a record for an average mile of 2.17, it is time that not only the trotting horse, but

also the trolley car, must look to their laurels. For several weeks past these carriages have been seen on the streets of New York city, and before long a regular service will be established.

There are 2 one and one-half horse-power Lundell motors on each carriage, both attached to the front axle, one to each wheel, and driven independently. The electric hansoms weigh about 2,500 pounds each, including the 800 pounds of chloride accumulators. It is expected, however, that the weight of the storage batteries will be reduced to 600 pounds.

The electric cab service will be established on similar lines to a livery stable. A building has been secured in Thirty-ninth street, where the cabs may be hired or ordered by telephone. There are four electric hansoms in service now, and more will be received, at the rate of two a week, until 12 are in service. An electric coupé, furnished with 2 two-horse-power motors, will also form a part of the equipment.

A Banquet at the Union League Club, Chicago.

At the banquet held under the auspices of the electric banquet committee at the Union League Club, Chicago, on February 18, the following were present: B. J. Arnold, F. B. Badt, W. E. Baker, Charles H. Besly, J. R. Chapman, Thomas H. Creden, E. B. Chandler, Max Eichberg, Prof. Elisha Gray, Charles E. Gregory, W. L. Githens, Angus S. Hibbard, W. S. Hine, Samuel Insull, Martin J. Insull, A. L. Ide, W. A. Jackson, W. A. Kreidler, W. J. Lloyd, S. J. Larned, Charles Munson, John B. O'Hara, Charles T. Page, R. E. Richardson, B. E. Sunny, Frederick Stevenson, C. H. Sewall, A. S. Terry, Henry S. Towle, A. D. Wheeler, J. B. Wallace.

The banquet was a very enjoyable affair, and gave occasion to renew old acquaintances and make new ones. Everybody was so well pleased with the arrangements and with the spirit of the enterprise that a vote of thanks was given to Mr. F. B. Badt, the secretary of the banquet committee, and he was instructed by a unanimous vote to send out invitations for another banquet, to be held on the second Wednesday in May. Prof. Elisha Gray acted as toastmaster, with his usual grace and humor.

A New New York Telephone Company.

The City and Suburban Telephone Company, of 203 Broadway, New York city, was incorporated at Albany on February 19. It proposes to operate in the principal cities and towns of the State. The capital stock is $100,000, and the directors are Alfred H. Teller, Charles B. Minsbull, Charles A. Teller and G. Rowland Munro, of Brooklyn; Henry B. Oakman and Samuel Bear, of New York city, and Charles E. Tompkins, of Jersey City.

The company is said to have acquired the New York State rights for the "make and break" transmitter and other apparatus controlled by the M. & B. Telephone Company and the United States Telephone Construction Company, both of Philadelphia. The "make and break" patent is in litigation, and has been for some time before the courts.

FIG. 2.—ELECTRIC SURREY.

FIG. 3.—ELECTRIC HANSOM.

New York Electrical Society.

The next meeting of the society will be held at Columbia University, Madison avenue and Forty-ninth street, on Wednesday, February 24, at 8 P. M. Mr. Willard E. Case will deliver a lecture on "Electricity from Carbon Without Heat." Special importance attaches to this lecture at the present time, when so many advances and ideas are being brought to notice by inventors. Mr. Case has long been an experimenter in this field, and has a great deal of interesting and valuable data, which will be appreciated by electrical engineers and students. Mr. Case has prepared for the occasion a variety of apparatus to illustrate types and principles.

Vice-President-elect Hobart is largely interested in electric railways in the vicinity of his home, in Paterson, N. J. On March 2, two days before inauguration, he will travel over a newly opened trolley line, forming the connecting link between the Newark & Passaic Electric Railway Company's line and the Consolidated Traction Company's road. Then he will board a steam railroad car and go down to Washington to the inaugural ceremonies. Politicians are already figuring on the possible mean of this direct comparison of steam and electrical traction.

"Astoria."

John Jacob Astor has given the name "Astoria" to his new hotel adjoining the Waldorf in New York city. It will cost, when completed, $5,000,000, will contain 1,000 rooms and will have the finest electrical equipment of any hotel in the world.

The Incandescent Lamp Combination.

As indicated in the ELECTRICAL REVIEW for February 10, 1897, the majority of the incandescent lamp manufacturers in the United States have made arrangements with the Westinghouse Electric and Manufacturing Company to take out licenses under royalty to manufacture incandescent lamps with cellulose filaments. Two or three companies, who have not secured licenses, have been proceeded against legally. The Westinghouse company is understood to own or control 72 patents on filament processes which cover all known types except the bamboo filament, which is too expensive for present use.

Referring to the lamp manufacturers' combination, Mr. L. H. Rogers, of the Adams-Bagnall Electric Company, of Cleveland, Ohio, is quoted in a newspaper interview as saying:

"They call it a trust and combination, but it is nothing more than an organization for our own mutual protection. Incandescent lamps are now being manufactured at a great loss, and we knew that something had to be done to save ourselves from bankruptcy.

"The price of incandescent lamps several years ago was from $1 to $1.25 each. The price has gone down rapidly since that time, until a few months ago, when the price reached from 15 cents to 20 cents each. As this is below cost, and as the consumer of incandescent lamps had been dictating the prices and running the manufacturers' business for quite a while, the manufacturers of incandescent lamps had the audacity to meet and discuss matters in New York city several months since. Their discussion resulted in an understanding that they would try and obtain enough for the incandescent lamps which they sold to pay their help for making them, the wild idea being expressed that it might also be possible to pay those who had invested their money in the business a slight dividend in the years to come. They call this a 'trust,' but, as above stated, if any one desires to step in the shoes of any of the incandescent lamp manufacturers, they probably can purchase any one of the plants at the cost of installing it.

"The price of incandescent lamps to-day is 22 cents each in small quantities, 20 cents in barrel lots. The cost of manufacturing them will vary, from the statement of a promoter attempting to interest capital, from 12 cents each to the figure as shown by the actual balance sheet of any manufacturer to-day, which would probably be 25 cents each. In other words, there is no money in the business at the present prices, and an incandescent lamp should not be sold for less than 30 cents under any circumstances. If any of the dear public are worried that our firm is making too much of a profit, they can have our factory and business at exactly what it has cost up to the present time."

The Siberian Railroad.

Mr. S. Marsh Young recently returned from a flying trip to St. Petersburg, Russia, on important railroad matters. Mr. Young's observing eyes found little to attract him in Russia as compared with the United States, but thinks that the new Siberian railroad the Russian Government is building will add materially to the prosperity and progress of that vast country.

THE EDISON COMPANY.

ANNUAL MEETING AND REPORT OF THE NEW YORK ORGANIZATION.

The annual meeting of the stockholders of the Edison Electric Illuminating Company of New York was held recently and the annual report was submitted. The income account has already been published, showing $966,380 net income, against $815,759 in 1895. Following is a record of the installations:

	1896.	1895.	Increase.
No. customers	7,898	6,928	970
No. inc. lamps	309,369	246,628	62,741
No. arc lights	5,559	5,031	528
No. motors, h.-p.	15,953	11,658	4,295
Total equiv. 16 c.-p.	618,991	483,605	130,386

Adding supplementary service, or emergency connections, with isolated plants, the installation figures on Edison and auxiliary services combined reach a total of 708,458 16-candle-power lamp equivalent.

The concentration in the larger stations and the increased operating economies, conjoined with the large extension of business in the past year, have resulted in a considerable decrease in the cost of current. The directors are giving careful consideration to a revision of the company's prices, which, by reducing the cost of current to the consumer, wherever practicable, will encourage further increase of business.

The general balance sheet shows:

ASSETS.	
License under Edison patents	$3,159,000
Investment accounts	10,227,712
Stock, Edison L. & P. Installation Co.	1,216,400
Accounts and bills receivable	189,703
Sundry accounts and supplies	111,234
Cash on hand	170,905
Total	$15,074,955
LIABILITIES.	
Capital stock	$7,938,000
First mortgage bonds	4,312,000
First consolidated bonds	2,130,000
Accounts payable	104,892
Dividend No. 47	119,055
License suspense account	62,000
Accrued interest account	71,866
Insurance reserve fund	24,461
Employés' benefit account	6,568
Sundry accounts	25,778
Depreciation reserve fund	88,784
Profit and loss	191,552
Total	$15,074,955

The highest load of the entire system taken together was on December 15, a maximum of 79,360 amperes. The best daily average of the system was on December 22, 28,926 amperes. The total current generated in the year was, in the downtown district, 68,738,565 ampere hours, and in the uptown district, 84,581,417 ampere hours: in both districts a total of 153,319,982 ampere hours.

The following board of directors was elected by a vote of 65,063 shares, out of a total of 79,380 shares: A. A. H. Boissevain, R. R. Bowker, C. H. Coster, Charles E. Crowell, R. Fulton Cutting, Thomas A. Edison, W. E. Glyn, Arthur Curtiss James, D. O. Mills, Geo. Foster Peabody, W. A. Read, F. S. Smithers and Spencer Trask.

The financial statement for New York city electric light plant for January shows that the profits from commercial lighting, over and above operating expenses, were nearly $900, and the permanent investment in the plant was increased by more than $825, in the extension of old lines and the construction of new ones, and the statement which was presented to the Board of Public Works shows the following: Income from commercial lighting, $3,123; expenses of operating, $2,226; balance, $897. The benefits accruing to the plant from the lighting of the streets, public buildings and St. Luke's

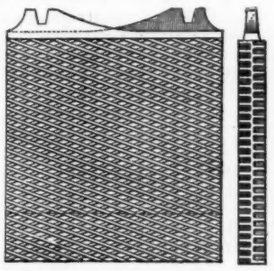


FIG. 1.—SIDE AND SECTIONAL VIEWS OF PLATE NEW YORK ACCUMULATOR AND ELECTRIC COMPANY'S STORAGE BATTERY.

Hospital, at the rates charged for commercial lighting, were $2,513, making a total advantage to the city of $3,410. The cost of constructing and extending lines was $827. The number of arc lights cut in during the month was six, and of incandescents, 502. The entire number of lights furnished from the plant is 237 arcs, of which 116 are a source of revenue to the city from commercial users, and 121 are in use to light the streets, armories and police stations. The streets are also lighted by 330 series lamps. Of incandescent lamps there are 8,417, of which 7,814 are in commercial use, and 603 are used by the city.

At Electric Light Headquarters.

Out-of-town visitors registered at the headquarters of the National Electric Light Association, New York, during the past week were: A. M. Young, Waterbury, Ct.; H. B. Cram, Boston, Mass.; Guy L. Feldman, Newark, N. J.; H. W. Wheeler, Boston, Mass.; J. E. Lockwood, Detroit, Mich.; Prof. Louis Duncan, Baltimore, Md.; Chas. E. Bibber, Boston; C. H. Watson, Matteawan, N. Y.; C. E. Newton, Hartford, Ct.; M. J. Perry, Providence, R. I.; H. A. Wagner, St. Louis, Mo.

The New York Accumulator and Electric Company's Storage Battery.

The New York Accumulator and Electric Company, of 150 Nassau street, New York city, have recently placed upon the market a storage battery which, they assert, possesses advantages which should recommend it to any one interested in the storage of electrical energy. In the accompanying illustration, Fig. 1, is shown a front and a side view of a battery plate. This consists of a single integral piece of pure lead. It is an open-work, ribbed and grooved plate, without any border. The ribs of one side of the plate cross those of the other and are bodily, and therefore electrically, joined to them. Where strength and durability are first considerations, the plates are made heavier, every tenth rib being made thicker and the adjoining grooves wider. The plate is made either by casting in a mould or else by pressing, rolling or sawing it out of a piece of pure rolled sheet-lead. It is claimed that a plate so constructed has greater strength and a larger exposed surface for a given weight than has any other form of ribbed plate.

The battery, Fig. 2, is of the Plante

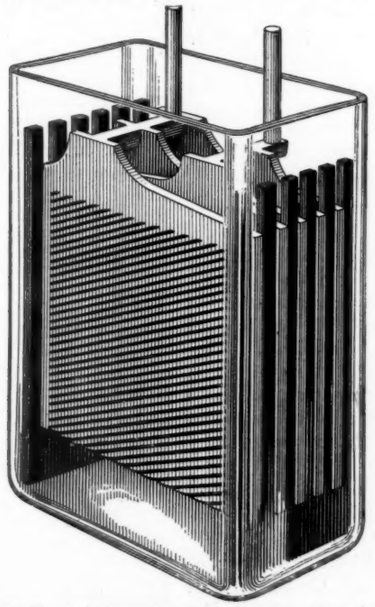


FIG. 2.—THE NEW YORK ACCUMULATOR AND ELECTRIC COMPANY'S STORAGE BATTERY.

type, the active material being formed directly from the lead itself by electrochemical action. The formation is very fine-grained in texture, compact and adherent. The average capacity ranges from three to five ampere hours per pound of element, though a higher capacity can be attained where excessive lightness of plate is desired. The internal resistance of the cell is very low. The insulation of the plates is said to be so perfect that a cell has retained the greatest part of its charge for a period of over seven months. The battery, it is said, will withstand an excessive charge and discharge rate without sustaining injury. For some uses the positive plates are especially protected by perforated sheets of insulating material secured close to the plate by means of soft rubber bands or otherwise. This prevents scaling and bridging. The battery has been subjected to severe and repeated tests for a period of nearly 18 months, and it is asserted will uphold all the claims made for it. This battery, the manufacturers state, is made under non-infringing individual patents, lately issued, owned by the company, which guarantee to purchasers full protection against litigation.

TELEPHONE MATTERS IN DETROIT.

A NEW INDEPENDENT COMPANY.

The promoters of the Detroit, Mich., Telephone Exchange have filed papers for two new telephone enterprises, with a combined capital of $1,100,000.

The first is to be known as the Detroit Switchboard and Telephone Construction Company, capitalized at $100,000. The purpose of the concern is to manufacture the electrical inventions of T. F. Ahern, the expert of the present Detroit exchange, and, especially, a patented switchboard, said to be the only one capable of serving 2,000 customers and not conflicting with Bell patents. The switchboard and other electrical devices will be sold to outside independent companies.

The other company will be known as the New State Telephone Company, with a capital of $1,000,000. The company will spread low-rate telephone service to all parts of the State. The beginning will be made in towns near Detroit. At present there are a number of small independent companies in Michigan, and it is proposed, as one step, to secure control of these. The low rates established by the Detroit Telephone Exchange will be made universal in Michigan. The stockholders of the two concerns are William L. Holmes, Charles Flowers, Alex. I. McLeod, Julius Stroh, Edward H. Parker, Frank A. Vernor, H. H. Hatch, T. F. Ahern, John T. Holmes, Hugh O'Connor. Officers were elected as follows: President, William L. Holmes; vice-president, Alex. I. McLeod; treasurer, Charles Flowers; secretary, Frank A. Vernor.

A New and Valuable Book.

"Gas, Gasoline and Oil Vapor Engines," by Gardner D. Hiscox, M. E. Octavo, cloth, 350 pp., 220 engravings. Price, $2.50. Sent, postage free, on receipt of price, by Electrical Review Publishing Company, 41 Park Row, New York city.

This, the only American book on the subject, is designed for the general information of every one interested in this type of motive power, and its adaptation to the increasing demand for a cheap and easily managed motor requiring no licensed engineer. The book treats of the theory and practice of gas, gasoline and oil engines, as designed and manufactured in the United States. It also contains chapters on horseless vehicles, electric lighting, marine propulsion, etc. In view of the rapidly increasing interest in isolated plants operated by gas engines, this book should enjoy a large sale among electrical engineers.

THE ATMOSPHERE ELECTRICALLY MEASURED.

To the Editor of Electrical Review:

There is an open field for the electrical student in devising means for the thorough investigation of the atmospheric disturbances which play so important a part in determining the weather. The present weather bureau is an admirable institution and does a great service to mankind; yet it is but an infant. It has a future of great promise; but it seems to us that will never be attained so long as the general observations of pressure, temperature, humidity, etc., are observed, substantially, only at the earth's surface, where local conditions exist to confuse the whole subject. We venture the prediction that eventually deeper study of all atmospheric phenomena will be made possible with electrical measuring and recording devices which will unerringly produce records of conditions found far enough above our terrestial surface to serve as a more reliable basis for prognostication than we have now.

The waters of the earth are mobile, and the attraction of the moon and sun sets up the tides diurnally and semi-diurnally, and the subject is one well understood. But the earth's atmosphere is still more mobile, being lighter and less viscous, and, moreover, has very much greater depth than any ocean, and the movements of the atmospheric tides must be far-reaching in their bearing on climatology.

It would be interesting to follow up the subject in its bearing upon many of the old "weather signs." The new moon, with its horns pointing downwardly, used to be, and often is yet, taken as a sign of wet weather to come. But why? The old-fashioned weather sharps say it is the result of observed facts, the syllogism of nature. But may it not have a better basis (supposing it to be true) in the physical conditions at the time? It would be more rational, for example, instead of asserting it is going to rain because the moon's horns are down, to say that the moon's horns are down because the moon is then in a particular part of her orbit where the joint or resultant attraction of the moon and sun on our atmosphere produces conditions therein as to wave occillation or tide, pressure, etc., indicating wet weather in the path of such disturbances.

With instruments of precision soaring aloft, and circuits capable of producing their lightest fluctuations under the eye of intelligent human observation on terra firma, much will be learned to throw light on the present darkness. We will not be satisfied with knowing a storm center has developed in a certain spot and is traveling in a certain direction; we must be able to seize upon the cause, both of the rise of the storm center in such spot and why it takes a particular direction. We will be able to closely watch the atmospheric disturbances so as to foresee clearly the inception of the storm and the exact spot where it will begin its devastating work.

There is much yet to be learned in climatological investigations, and electricity is bound to become an indispensable adjunct.

T. J. McTighe,
Electrical Engineer.

New York, February 10.

NEW ENGLAND NEWS.

The new firm of Huntress & Ewing, 8 Oliver street, Boston, is representing the Walker company, of Cleveland, in that locality.

The Globe Electric Light Company are now operating an extensive factory, well equipped with modern machinery, and have every facility for a large production of incandescent lamps.

The Lynn Incandescent Lamp Company, Lynn, Mass., according to President Dwyer's statement, is greatly crowded to keep pace with the renewal orders for the lamps by the company's special process.

The well known firm, Bibber-White Company, Boston, since its reorganization, has entered actively into the field with a large line of special electrical supplies, and now has one of the most extensive establishments in New England.

The Anchor Electric Company, Boston, speak encouragingly of more activity as to the general demand for electrical supplies, and especially for the "Anchor" switches, and have recently perfected new designs in water-tight, cluster, light, pole-changing and heater switches.

The new plant of the W. S. Hill Electric Company at New Bedford, Mass., for the production of the new standard "Hill" switches and switch-boards, adds one more factory to which New England may point with pride as an indication of the fast growth of her electrical industries.

The Spring Park Laboratory, Jamaica Plain, Mass., is having a much greater demand for fluoroscopes and fluorescent screens of the new non-phosphorescent salts as the importance of this discovery becomes more generally appreciated. This new crystal, by a number of scientists who have experimented with it, is said to be one of the features in recent developments in the growing X-ray science.

One thousand telephone instruments were included in an order recently placed with the Connecticut Telephone and Electric Company, of Meriden, Ct., and Chicago. This order is for the exchange at Des Moines, Iowa. This must be accepted as a strong indorsement of this progressive company's instruments, as the order was placed after a rigid examination of the apparatus offered by the telephone field.

LITERARY.

The *Review of Reviews* for February makes "A Plea for the Protection of Useful Men" from bores and "societies," and all well meaning people who bother the life out of public men by letters and calls on the pretext of seeking assistance in some worthy undertaking. The editor of the *Review* publishes letters on this subject from the late Gen. Francis A. Walker, written only a few weeks before his death. In one of these letters General Walker wrote, "I am not well, and neither callers nor correspondents have any mercy."

THE TELEPHONE SITUATION.

PAPER READ BEFORE THE CHICAGO ELECTRICAL ASSOCIATION, FEBRUARY 5, 1897, BY W. CLYDE JONES.

(*Concluded from page 79.*)

The Berliner application was in the Patent Office 14 years, and this long delay, together with the fact that the controlling claims, granted at a time when the original Bell patent was about to expire, were founded upon an invention made but shortly after Bell's invention, and the fact that this second controlling patent would practically double the telephone monopoly, led to the institution of a suit by the government to annul the patent on the ground that the applicant and his assignees, the American Bell Telephone Company, had been guilty of fraud or misconduct in delaying the issuance of the patent, and on the ground that the Commissioner of Patents had exceeded his powers in the granting of the patent. At the hearing other objections to the validity of the patent were raised, but the Court of Appeals held that these could properly come before the court only in an infringement suit, and not in a suit by the government to annul the patent for irregularity in the method of granting the patent. The Court of Appeals held that the facts attending the delay were not such as would lay either fraud or misconduct at the door of the patentee or his assignees, since the delay had been occasioned by the rules and procedure of the Patent Office, and the court held that the Commissioner of Patents had acted within his powers in granting the patent. The case was appealed and has been argued before the Supreme Court. Should this court find the patent to be irregular, the controversy will be at an end. If the Supreme Court, however, follows the decision of the Court of Appeals, it will declare the grant of the patent regular, and then, when an infringement suit is instituted against an alleged infringement, all the objections to the patent which are claimed to invalidate it, outside of the question of irregularity in the grant, will be considered. Should the Supreme Court, however, choose to consider all of the objections urged against the patent, its decision will terminate the controversy.

It may be interesting to consider what are some of the defenses to the validity of the patent which would thus arise in an infringement suit.

One of the defenses is that the constant-contact feature was not present in the Berliner application as originally filed, the application showing only the make-and-break double-contact transmitter above referred to, and that the constant-contact feature was interpolated into the case only after the publication of Edison's constant-contact carbon telephone. If this can be proven, it will, of course, invalidate the Berliner patent.

Another defense is that the first claim of the Berliner patent, purporting to cover the method of producing an undulatory current by varying the pressure between two electrodes in constant contact, does not define a method within the contemplation of the patent laws. It has been held that a patentee is not only entitled to a patent on the mechanism he may use for practicing his invention, but if an action or change of a chemical or elemental nature takes place, he is also entitled to a claim for the method. To be a proper and legal method claim, it must occupy a somewhat difficultly defined position between two extremes; it must not be a claim for a principle or law of nature, and it must not be for the mere function or operation of a machine of mechanism. For instance, had Henry or Faraday, upon the discovery of the law of magnetic induction, claimed the method of inducing an electric conductor in a circuit which consists in varying the magnetic field to which the circuit is subjected, the claim would have undoubtedly been held void as claiming a principle or law of nature, since the claim is but the statement of the law of induction, which is as absolute and independent in its invariable action as the law of gravitation, which acts, when it acts, always in one unchangeable manner, regardless of any human interference. Human agency may control the time of its action, but not the nature of its action.

On the other hand, the method, for instance, of producing a variable flow through a water pipe which consists in continuously varying the port or opening in a valve would not be a proper method claim, since it describes merely the mode of operation of a valve; that is, the function of a mechanism. Likewise the description of the operation of any particular mechanism for varying the flow of a current along an electrical conductor would seem to be the description of the mode of operation of the mechanism merely and not a proper method claim. As an illustration of a proper method claim, lying between this Scylla of a principle or law of nature and this Charybdis of a mode of operation of a mechanism, may be cited the method claim of the original Bell patent, which is as follows:

5. The method and apparatus for transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations, similar in form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth.

This claim has been held by the Supreme Court to be a proper method claim. It does not define a law of nature, because human agency must intervene to make the laws of force and the law of induction co-operate and act in a particular manner different from that in which they would act were they left to act uncontrolled. In other words, human agency is an element of the process, and thus the process is not a law of nature. On the other hand, the method is not the description of the mode of operation of a mechanism, since it can be contemplated independently of any mechanism. It is one of the tests of a legal process that it can be entertained by the mind independent of any material agency or mechanism for effecting it.

We have seen, however, that undulatory currents can be produced, first, by varying the electro-motive force of a current, and, second, by varying the resistance which the current encounters. It will be noted that the method of producing an undulatory current is a method which does not define a principle or law of nature, nor does it define the mere operation of a mechanism, since we can contemplate the varying of the electro-motive force of a current independently of any specific mechanism for effecting such variation. Likewise, the method of producing an undulatory current which consists in varying the resistance to which the current is subjected would seem to define a proper method. Both of these methods are the invention of Bell, and were disclosed in his patent, so that he alone of the telephone inventors was entitled to make these claims.

Had Bell drawn a claim to cover the method of producing an undulatory current by moving a mass of magnetic metal toward and from the pole of an electro-magnet, it would seem that the claim would not have been a proper method claim, since it defines the mere operation of a piece of mechanism, the only proper method claim capable of being drawn upon

this operation being that for varying the electro-motive force, on the grounds, it is contended, that the method claim of the Berliner patent, which is drawn to the method of producing undulations by varying the pressure between electrodes in constant contact to vary the resistance, is but a description of the operation of a mechanism, the only proper method which can be drawn to the invention being that relating to the varying of the resistance; but this Berliner was not entitled to make, as it was disclosed by Bell in his liquid transmitter.

It is further argued that, even though the claim be admitted to be a proper method claim, it defines the method of Bell's electrode transmitter, which shows means for varying the resistance by varying the surface contact between two electrodes, which is the operation of the Berliner electrodes.

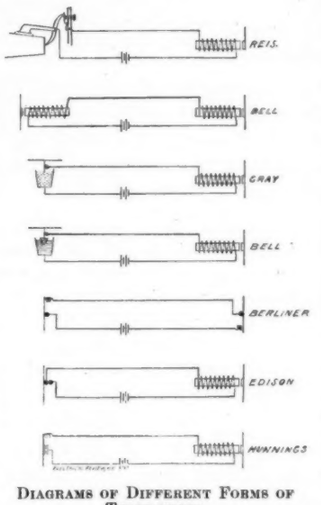
It is also argued that the second claim of the Berliner patent defining the mechanism defines the structure of the Bell electrode transmitter, which also varies the resistance by the variation in pressure between the electrodes, causing, as in the Berliner transmitter, a variation of the surface cantact between the two electrodes. It is also pointed out that the use of two solid electrodes is not new with Berliner, these having been employed by Reis, whose mechanical construction was the same as that of Berliner. In the use of his transmitter, however, Reis did not maintain the electrodes in constant contact, though without changing the construction, and by the adjustment of a spring, the Reis electrodes may be maintained in constant contact and will transmit speech. It is contended that the novelty in the solid electrode constant contact resides in the use of Reis's transmitter, in accordance with the method of undulations invented by Bell. Bell used a constant-contact transmitter having one liquid electrode, and the probability is that, prior to Edison's discovery of the yielding nature of carbon under pressure, speech had not been satisfactorily transmitted by solid electrodes in constant contact.

Another ground for the invalidity of the patent is that a patent was granted to Berliner, November 2, 1880, No. 233,959, which is alleged to cover the same invention. After his experiments with the microphone transmitter, Berliner found that if an undulatory current be passed through two electrodes in constant contact, the electrodes will become charged as the current rises and the electrodes will repel each other; as the current decreases the charges decrease and the electrodes move together, due to the resiliency of the diaphragm. The device thus acts as a telephone receiver. The mechanical construction of the receiver is identical with that of the transmitter, and the device can be used either as a transmitter or as a receiver accordingly as it is spoken into, or as an undulatory current is passed through the electrodes. This fact led Berliner to associate two of the instruments at opposite ends of a telephone line, so that conversation could be carried on with the two instruments, the instrument at one end of the line being used as a transmitter, while that at the other was being used as a receiver to transmit speech in one direction; and when it was desired to transmit speech in the opposite direction, the instrument formerly used as a transmitter was used as a receiver, and the instrument first used as a receiver was now used as a transmitter. Each of the instruments thus served, in turn, as a transmitter and as a receiver. Claim 4 of this patent is as follows:

4. A system of two or more telephone instruments in electrical connection with each other, each consisting of two or more poles of an electrical circuit in contact one with another, either or both poles of each instrument being connected with a vibratory plate, so that any vibration which is made at one contact is reproduced at the other, substantially as described.

This claim is not drawn to the receiver alone, as are the other claims of this patent, nor to the transmitter alone, as are the claims of the 1891 patent, but to an association of two instruments, each capable of two uses, first, as a transmitter, and, second, as a receiver. In other words, this claim covers an apparatus having two functions, first, the transmission of speech, and, second, the production of speech.

The Supreme Court has held (Miller vs. Eagle Manufacturing Company, 151 U. S., 186) that where a patent has been granted upon a certain structure having two functions or modes of operation, a subsequent patent upon the same structure, but claiming but one of the functions, is invalid. The invention related to



DIAGRAMS OF DIFFERENT FORMS OF TELEPHONES.

a peculiarly shaped spring, which acted upon a plow beam when at a certain height, to press the same into the ground, while, when the beam was at a greater elevation, the spring served to support the beam in an elevated position. The earlier patent claimed the spring of the peculiar shape, having the function of lifting the plow beam and also depressing the plow beam, while the latter patent claimed the same peculiarly shaped spring, having the lifting function alone. It is argued that the earlier Berliner patent claims the electrode transmitter, having the function of transmitting and of receiving speech, while the latter patent of 1891 claims precisely the same structure, having the one function of transmitting speech. It is claimed that the Berliner patents bear exactly the same relation to each other as do the plow-beam patents, and that, in consequence, the later Berliner patent is void, since the earlier Berliner is for the same invention.

Considering the future development of the transmitter, it will appear that if the Berliner is sustained, it will be necessary for the competition companies to employ the magneto telephone, or to develop some form of the liquid electrode transmitter adapted for practical use. Should the Berliner patent be declared void, either in the suit now before the Supreme Court or in a subsequent infringement suit, the microphone transmitter, being open to the public, will continue in general use.

Considering the remaining features which enter into a complete telephone exchange, the receiver is at present open to the public, there being no fundamental patent which covers the receiver. The controlling patents in the apparatus at the subscriber's station have expired, so that a complete subscriber's station outfit may be employed without infringing any patents. There are many patents on details of construction, but these cover only special arrangements and constructions not essential to the complete equipment of the system.

While there are a great many patents on the switchboard, there are none which cover the switchboard so broadly as to prevent the use of a switchboard and complete equipment in a telephone exchange. For small exchanges, where a single board is employed, the broadest patent now in force is the Eldred patent, No. 303,714, purporting to cover broadly the employment of means for cutting apparatus, such as an operator's telephone, calling generator, etc., into the circuit of the cores used for making connection between several telephone lines. To avoid infringement of this patent, means must be provided for connecting the operator's telephone and the calling generator in circuit without looping into the core circuit.

For large exchanges, where all of the subscriber's annunciators can not be placed upon a single board, and a number of boards must be provided, a problem was presented which led to the invention of the trunk-line system, in which the subscriber's lines are divided into groups of lines terminating in spring-jacks or connecting switches upon a separate board. Lines which terminate upon a single board may be connected in the usual manner by a pair of plugs connected by a flexible conductor. When it is desired to connect lines terminating upon different boards, the connection is completed through a trunk line extending beneath the boards. This system of divided boards connected by trunk lines is not covered broadly by a patent.

In the early development of large exchange switchboards the multiple board was invented, and is covered broadly by letters patent granted to Firman and numbered 232,575. According to this system, a number of boards are provided, and each telephone line of the exchange is connected with a switch upon each board, each line being thus multiplied upon all the boards, so that a connection may be made with any line at any board. Upon each board are provided the calling annunciators of a group of the subscribers, say 300, so that all calls initiating from the subscribers of any group will be attended to by the operator at the board upon which their annunciators are placed. The connection is usually made by placing one plug of a pair in the switch socket of the calling subscriber, while the other plug is placed in the socket of the called subscriber. The system is readily expansible by adding new boards and extending all lines to switch sockets upon the new boards.

Owing to the advantages of this system for large exchanges over the divided board system employing trunk lines between the boards, the latter system was practically abandoned for large exchanges until within a few years, and many patents have been granted covering every phase of the multiple switchboard. It is now found, however, that the divided board system, with some improvements, is quite as well adapted for large exchanges as the multiple board system, and in many particulars possesses marked advantages over the multiple board system. To such an extent, in fact, is this true that a number of the largest cities are now changing from the multiple system to the divided board system.

The result is that large exchanges as well as small exchanges can be installed without the infringement of any fundamental patents.

It thus appears that there are now in existence no patents which prevent the installation and operation of an exchange in its entirety, and that the only patent in any wise controlling in its scope is the Berliner patent, purporting to cover every form of microphone transmitter. While it is of the highest importance to the public at large to possess the microphone transmitter in the operation of exchanges, it is by nowise essential, and it is safe to say that should the Berliner patent be sustained, inventive genius will improve the magneto telephone or the liquid electrode transmitter to the degree which will place in the hands of the public at large a thoroughly successful transmitter.

Why the Morse Alphabet Failed in the Deaf Mute Asylum.

TO THE EDITOR OF ELECTRICAL REVIEW:

Your issue of the 10th instant, received this day, contains a letter from Dr. Hachenberg, of Austin, Tex., suggesting the teaching of deaf mutes through the medium of the Morse telegraph alphabet. Experience has shown that this plan is not practicable.

Something like 13 or 14 years since, Prof. C. H. Haskins, then a member of the Board of Charities and Reforms for Wisconsin, visited the asylum at Delevan, with the rest of the board, on an official inspection. While there he suggested the Morse alphabet as a medium of conversation between the unfortunates. The management was highly pleased, and when it was explained to the pupils they, in turn, were delighted.

Professor Haskins, who, as you know, was one of the pioneers in telegraphy, stepped up to the blackboard and drew the alphabet, which was explained, and the pupils requested to copy it; and the method of communicating by touch was illustrated. Deaf mutes are proverbially quick to learn, and only a few days elapsed before the alphabet was mastered, and conversations were constantly going on between pupils.

Right here a new difficulty arose, which fatally condemned the scheme in toto. The lack of the powers of speech and hearing renders a deaf mute peculiarly sensitive, and out of this grows the most deep-rooted jealousy. No sooner were two engaged in this secret conversation, and any other inmate happened to catch a glance of one of the party's eyes, than the green-eyed monster took posession of the looker-on, and the teacher was informed that So and So had been "talking about me."

There was another curious fact developed, which became an annoyance, and was subversive of good order. After the lights were extinguished in the dormitories, the inmates had formerly nothing to do but go to sleep, but now they could and did talk by touch, and they were enabled to run from bed to bed and carry on a silent conversation, occasionally breaking out into a laugh, which discovered them.

It finally became necessary to forbid the use of the alphabet under all circumstances, and the use of touch conversation was decided a failure.

Yours, C. C. HASKINS.

Chicago, February 13.

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NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, FEB. 24, 1897.

CONTENTS.

	PAGE
Views, News and Interviews	85
Electric Carriages in New York City	85
Cost of Steam Railway Track in 1830	85
A Banquet at the Union League Club, Chicago	86
A New New York Telephone Company	86
New York Electrical Society	86
"Astoria"	86
The Incandescent Lamp Combination	86
The Siberian Railroad	86
The Edison Company	87
At Electric Light Headquarters	87
The New York Accumulator and Electric Company's Storage Battery	87
Telephone Matters in Detroit	87
A New and Valuable Book	87
The Atmosphere Electrically Measured	88
New England News	88
Literary	88
The Telephone Situation	88
Why the Morse Alphabet Failed in the Deaf Mute Asylum	89
The Broadway Cable Curve	90
Traction Consolidation in Brooklyn, N. Y.	90
X Rays in Court	90
Washington To Be Brilliantly Illuminated	91
Personal	91
The X-Ray Phenomena and Their Useful Application	92
Heating and Cooking by Electricity	93
The American Street Railway Association	94
Voltaic Batteries Are Thermo-Electric	94
Telephone News and Comment	94
Items of Interest	94
Electric Light Flashes	95
"Flowed" Steel	95
American Institute of Electrical Engineers	95
Advance Information	96
General Notes	96
Kindred Interests	ix
Metropolitan Street Railway Sued	ix
Electrical Patents	x
A Packard Lamp Catalogue	x

INDEX OF ADVERTISERS.

COVER PAGES.

	PAGE
Abendroth & Root Mfg. Co., boilers	xvi
American Electrical Works, insulated wire	i
American Engine Co., American-Ball engines	i
Babcock & Wilcox Co	xvi
Ball & Wood Co.	xvi
Bunnell & Co., J. H., dry batteries	i
Campbell & Zell Co	i
Crefeld Electrical Works	i
Crocker-Wheeler Electric Co	i
Day's Kerite, insulated wire	i, viii
Electric Appliance Co., supplies	i
Electric Storage Battery Co	ii
Fort Wayne Electric Corporation	xvi
Greeley, The E. S., & Co., electrical supplies	i
Interior Conduit and Insulation Co., Lundell dynamos and motors	i
Iron Clad Rheostat Co	i
Lombard Water-Wheel Governor Co	xvi
New York Insulated Wire Co., Grimshaw wires and cables	i
New York & Ohio Co	i
Okonite Co., insulated wire	i, xvi
Safety Insulated Wire and Cable Co	i
Standard Paint Co., insulating compound	i
Stanley Electric Mfg. Co., S. K. C	xv
Stirling Co., water-tube boilers	xvi
Thayer & Co	i

INSIDE PAGES.

American Bell Telephone Co	xiii
American Electric Telephone Co., long-distance telephones	xiii
Aylsworth & Jackson	xi
Baker & Co., platinum	vi
B. & O. R. R.	vii
"Big Four" R. R.	vii
Bliss Co., E. W., presses, dies, shears, etc.	iii
Bogart, A. L.	vii
Brady, T. H., Brady mast-arms	xi
Brill, J. G., Co.	xii
Brixey, W. R., Day's kerite wires and cables	viii
Brush Electric Co.	xiv
Bubier Publishing Co	viii
Camp & Co., H. B., vitrified clay conduits	iv
Carbutt, John, X-ray plates and films	xi
C. & C. Electric Co	v
Central Mfg. Co	vi
Clonbrock Steam Boiler Co	iii
Coles, Walter S.	x
De Veau & Co	xiii
Dixon, Jos., Crucible Co., belt dressing	xi
Diehl Mfg. Co	iv
Duval, E. S., Jr., patents	x
Dyer & Driscoll, patent solicitors	x
Edison Mfg. Co	xi
Electric Launch Co	ix
Elwell-Parker Electric Co. of America	vii
Empire China Works, porcelain specialties	xi
Eppenger & Russell Co., Valentine subway electrical conduit	vi
Eyanson & Armpriester	vi
Faraday Carbon Co., carbons	viii
Forest City Electric Co	iv
Frei & Co., G. A., X-ray supplies	xi
Globe Electric Heating Co	vi
Green & Bauer	xi
Hampson, E. P., & Co., engines	vii
Hemingray Glass Co	ix
Hooven, Owens & Rentschler Co., electric railway and electric light engines	iii
Huebel & Manger	xi
Imperial Porcelain Works	iv
India Rubber and Gutta Percha Insulating Co	iv
International Correspondence Schools	x
Jewell Belting Co	xii
Kent Electric Mfg. Co	xi
Keystone Electrical Instrument Co	viii
Lehigh Valley Creosoting Co., creosoted lumber	ix
Locke, Fred M., insulators and line material	v
McIntire, C., Co	ix
McLeod, Ward & Co	ix
Manhattan Electrical Supply Co	xii
Marshall, Wm., condensers	x
Mason-Maxwell Telephone Mfg. Co	xiii
Metropolitan Electric Co	iv
Mexico Telephone Co	xiii
Murdock & Taber	xiii
New England Engineering Co	vi
New York Central Railroad	vii
New York Telephone Co	ix
Novelty Electric Co., supplies	vi
Ostrander, W. R., & Co., supplies	x
Partrick & Carter Co., electrical supplies for housework	ix
Pearsall, A. B.	ix
Pettingell-Andrews Co	vii
Phillips Insulated Wire Co., wire	viii
Reisinger, Hugo.	viii
Ritchie & Sons, E. S.	xi
Royce & Marean, electrical supplies	x
Sessions Foundry Co	iv
Schiff, Jordon & Co., carbons	iii
S. E. I. Co	viii
Siemens & Halske Electric Co. of America	xiv
Solar Carbon and Manufacturing Co	vi
Spring Park Laboratory	xi
Standard Thermometer & Electric Co	vi
Toomer, Nunn & Co	ix
Utica Electrical Mfg. & Supply Co	ix
Viaduct Mfg. Co., telephones, etc	xiii
Wedderburn & Co., John, patents	x
Western Electric Co	xii
Western Telephone Construction Co	xiii
Westinghouse Electric & Mfg. Co	iii
Weston Electrical Instrument Co., measuring instruments	viii
White-Crosby Co., contracting engineers	ix
Whitney Electrical Instrument Co	x

In view of the fact that New York city is soon to have an electric cab service, an important question arises: What name shall we give to the hired man in control of an electric carriage? Suggestions are in order.

THE BROADWAY CABLE CURVE.

The question of the Fourteenth street curve on Broadway, New York, is receiving considerable notice. Why should there be any curve? The cable line could be extended directly across Union Square Park from Fourteenth street and Broadway to Seventeenth street and Broadway in a manner that would prove of advantage to the public and entirely eliminate the danger now existing at these curves, and which would continue to exist in a degree, even if the speed is made slower. The road across the park, if slightly depressed, would be made an attraction instead of an objection. The park paths as at present could remain, with a few steps at either side of the road crossings to a bridge passing over the tops of the cars, and there could be two or three points at which passengers could get on and off the cars. A few artistic touches in the way of terraces, flowers and vine-covered railings would make the whole scene an unobjectionable one.

[Since the above was written, President McMillan, of the Park Board, has proposed a similar scheme to Mayor Strong.—ED.]

TRACTION CONSOLIDATION IN BROOKLYN, N. Y.

There is a strong sentiment in Brooklyn, N. Y., in favor of the consolidation of all the surface and elevated railroads in that city. Such a combination would result in a large saving in the operating expenses of the roads. With the adoption of electric power on the elevated lines, the total economies would reach nearly $1,000,000 a year, according to one estimate. The elevated roads have suffered so much loss of traffic to the surface cars that they are especially interested in any plan which will put them on their feet again. We believe that a plan of consolidation of all the Brooklyn roads was considered a year or more ago, and that the scheme has never been entirely abandoned. It is to be hoped that a movement of this kind may ultimately be carried through, so that when a similar consolidation occurs in New York city (if it ever does), it will be easy to combine the rapid transit systems of Greater New York into one.

X RAYS IN COURT.

The X rays have got into court again. John M. Mallet, a negro athlete, of Chicago, has begun suit against Dr. O. L. Schmidt for $10,000 damages for injuries received in an X-ray examination. According to press dispatches, Mallet had carried a bullet in his body for two years. Dr. Schmidt was recommended to him as an expert in X rays. While trying to locate the ball the physician, so Mallet claims, remarked: "I wonder if it takes longer for the X ray to penetrate the body of a colored man than it does that of a white man?" Mallet was submitted to an exposure under the rays of 35 minutes, and alleges that a sore developed on his breast as a result of the X-ray experiments, and that because of this wound he was forced to give up work and lost much sleep. Any physician who uses X-ray apparatus should certainly be aware of the "sun-burn effect" so often chronicled in the technical and lay press. At any rate, with the up-to-date apparatus now on the market, and the modern methods in vogue, there is no necessity for 35-minute exposures.

It is announced that General Manager Fransioli, of the Manhattan Railway Company, after a visit to Chicago, has recommended that the Second avenue elevated road be equipped with electric power on the third-rail system. It is believed that the board of directors will carry out Mr. Fransioli's suggestion, and that eventually the Third, Sixth and Ninth avenue lines will be similarly equipped. Under the proposed plans for equipping the Second avenue line, the motors will have a maximum speed of from 30 to 40 miles an hour, and trains will be run under a headway of one and one-half minutes. Has the Manhattan Railway Company at last awakened to the advantages and economies of electric propulsion, or is this latest report a dream similar to those in the past? Let's hope it is true.

Although the Board of Electrical Control, of New York city, passes out of existence by limitation of law on November 1, 1897, it is probable that Commissioners Hess, Hamilton and Kearney will have to serve two months longer, or until January 1, 1898. Under the new Greater New York charter the work of this board is transferred to the commissioner of a new department, to be known as the Department of Public Buildings, Lighting and Supplies. This department does not come into existence until January 1, 1898. A law will probably be passed extending the terms of the present Subway Commissioners until such time as the new department is legally in existence.

In a communication published on another page, Mr. T. J. McTighe makes some valuable suggestions in climatology which our Weather Bureau would do well to consider.

WASHINGTON TO BE BRILLIANTLY ILLUMINATED.

EXTENSIVE USE OF THE ELECTRIC LIGHT IN THE INAUGURAL CEREMONIES ON MARCH 4.

All Washington is now preparing for the inaugural ceremonies of President-elect McKinley, and the electrical display in this connection, both public and private, will be one of the greatest features at the capital city on March 4 next. The beauty of the city, as shown under the brilliancy of many electrical search-lights, will be a revelation; will be one of the grandest sights ever witnessed.

It is proposed to illuminate every public building in Washington, and from the roofs of all the larger government departments strong search-lights are to be used, the rays of which are to be thrown to designated points about the city with a view to artistic effect. For instance, it has been submitted, and no doubt will be put into effect, the placing of, say, 15 or more projector lights of high candle-power around the Capitol Building at a radius of, say, about one mile from that building, throwing the shafts of light so as to have all converge at a point about 500 feet above the head of the Goddess of Liberty, which surmounts the Capitol dome, and from the top of the dome throw a light directly upward to meet and pass through the converged point of the other lights, thus bringing into effect an immense Maypole.

THE CAPITOL.

Mr. Elliott Woods, assistant architect of the United States Capitol, has proposed to Chairman Bell, of the inaugural committee, and had accepted, a novel and unique scheme for lighting the Capitol Building on the night of March 4. It is proposed that the building shall be illuminated by search-lights, to be placed at points around the grounds about 500 feet from the structure, which would locate them near the limits of the Capitol Park. Four such lights, stationed at the four corners of the park, and an equal number, or perhaps less, placed at intermediate points, would be sufficient to exhibit the white building in effulgent splendor against the night's dark background. The darker the night, the more striking would be the effect made by the building standing out in relief against the sky. The piercing rays of six or eight strong lights, diverging from as many different points and directed upon the building, would produce an effect the brilliancy and dazzling splendor of which have never been attempted in the way of illuminating the Capitol. The building, standing, as it does, upon a considerable elevation, could be seen as plainly as in daylight from all portions of the city and, in fact, it is believed, for miles around.

It is further suggested that on the dome of the building, at the foot of the goddess and within the perpendicular columns upon which she stands, there shall also be located a number of calcium lights, which shall throw their radiance out upon the sky, giving the dome of the Capitol the appearance of a brilliant star. By alternating the lights on the ground—which are to be directed against the edifice—with those in the dome, the effect of the rays would be dazzling in splendor. By the use of the ordinary stage screen, the scene could be varied with a profusion of colors, while the same used in front of the lights in the dome would throw a rainbow of brilliant colors in all directions.

The advantage of this plan is, first, it simplicity and corresponding cheapness, while it is clearly to be seen that nothing has ever before been attempted on such an elaborate plan. It is estimated that the entire cost of this scheme of illumination will not certainly exceed $1,500, and probably not half that amount, if 13 arc lights, representing the 13 original States, were used instead of the calcium search-lights in the dome, although, of course, the effect would not be so brilliant or striking.

The electrical plant at the Capitol is amply sufficient to supply all the power needed, and underground wires are already run to all sections of the grounds to feed the 150 new arc lamps recently installed about the park. The greatest difficulty would be found in placing the search-lights in the dome and stringing a cable from the basement, some 300 feet, to the top of the building, if electric search-lights are decided upon for that point. The plan to cope with this objection is to run the line from a window in the basement, on the outside of the building, to the dome, and have it properly secured at different points. This was done, though with much smaller cable than will now be required, at the time the Capitol was illuminated during the Pythian encampment four years ago. Then there were only about 30 incandescent lamps of 100 candle-power each, yet they made a brilliant display. The effect of several search-lights, with from 2,000 to 10,000 candle-power, would be a hundredfold greater.

It was first thought that the outline of the Capitol building could be traced with incandescent lamps and thousands of them used. Another idea was to brilliantly light all the windows from the basement to the dome; but while the effect would be much less magnificent, the cost would be equal, if not greater than the search-light scheme. Rain on the night of March 4 would not interrupt the plan in the least, for in that event the heavens would be blacker and afford a much better background, against which the picture would be thrown in relief.

THE PENSION BUILDING.

In this building is to be held the inaugural ball, and it is to be illuminated entirely with electric lights. The work of installing the fixtures and lights and their arrangement, etc., is given by contract. Several plans were submitted, but the committee, wishing to avoid all appearance of advertising, and with a view to simple artistic illumination only, selected the plan of Mr. John R. Galloway, of this city.

Supporting the first gallery, running entirely around the large interior court of the Pension Building—the inaugural ball-room—are 72 columns, and the same number supporting the second gallery. Around each column, just beneath the impost, is to be placed a cluster of incandescent lamps of 16-candle-power each, the majority of each cluster facing the ball-room. Frosted lamps and gold fixtures are to be used to correspond with the white and gold decorations of the Pension Office interior. This will take 1,152 incandescent lamps, while added to these, and hung from the keystones of the arches between the supporting pillars, are 150 incandescent arc lamps. This will complete the illumination proper, with the exception of the reception-rooms, dining hall, etc., which are to be fitted up with the plain incandescent lamps. The picturesque effects are to be derived from thousands of miniature lamps of all colors interspersed in the banks of foliage, and it is claimed that, when finished, it will eclipse anything ever attempted in this manner of electric display.

In each of the four corners of the ball-room, to be built of foliage and mosses to the height of about 10 feet, are what are to be, in effect, immense flower pots, and banked upon these and gracefully hanging over the top, extending 10 or 15 feet, are to be hundreds of plants, palms and flowers, all brilliantly illuminated with the dazzling glimmer of hundreds of multi-colored miniature lamps.

Half way to the center, and running on each side of the hall in its longest direction, are four immense pillars, which extend from the floor to the roof of the Pension Office. These eight massive supports are to be converted into immense jardinieres containing a veritable forest of palms, evergreens and flowers, each to be set off in magnificent splendor by the elaborate display of miniature lamps. The fountain directly in the center of the immense court will be a veritable electric fount, and in electric and floral beauty surpass anything ever attempted heretofore at an inaugural ball.

At the west end of the ball-room is to be placed a large electrically illuminated waving flag, the insignia of freedom, liberty and republican government. This flag is 12 feet long and seven and three-fourths feet high, and is made of wood, in two sections, the red and white stripes being painted in waving lines along the surface. The blue field for the stars is also painted, and each star is made of metal, in the center of which is inserted the receptacle to contain the lamp. Thus, when the lamps are lighted their light is reflected by the metallic stars. Upon the stripes red and white lamps are used, and the whole is operated by an automatic motor switch, which, when connected to the circuit, so operates the lamps as to give the whole flag the appearance of waving in the wind. The flag presents a most beautiful spectacle, and is particularly appropriate for this occasion. It requires about 60 amperes of current on a 110-volt circuit.

Over the band stand, at the other end of the hall, is placed the sign of the eagle and shield, as another patriotic insignia. The shield is also made of wood, covered, as to its upper part, with blue silk, the stripes being composed of red and white ribbon. The shield is outlined with gold on yellow cord, which is also used to separate the field of the stars from the stripes, the whole being surmounted by a stuffed American eagle bearing three arrows in its claws. White frosted lamps are used on the white stripes and red lamps on the red stripes. It is a still piece, and when once lighted has no changing or moving effect. It is three and one-fourth feet high and four and one-fourth feet wide, taking about 10 amperes on 110-volt circuit.

The grounds around the Pension Building will be lighted by about thirty 2,000-candle-power arc lamps.

OTHER ILLUMINATION.

After the general display of fireworks at the White Lot, in rear of the President's Mansion, it is proposed to illuminate Pennsylvania avenue from the Treasury Department at Fifteenth street to the Capitol Building, a distance of about one and one-half miles.

The New National Library will, for the first time since the installation of its electric plant, test to the full capacity its four generating sets. The building and grounds are to be illuminated brilliantly, and, when taking into consideration that it is the finest and most beautiful building of its character in the whole world, both as to its interior and exterior, it will be a sight well worth seeing.

The Agricultural Department is contemplating the erection of an immense electrical sign of block letters, using the word "Agricultural," thus showing that the Government of the United States, through its progressive Secretary of Agriculture, sees the benefit of electrical sign advertising.

The tall white shaft, Washington's Monument, will be thrown in relief against the dark background of historical Arlington by the use of several search-lights.

Pennsylvania avenue, aside from the public illumination, will be ablaze electrically. All of the larger business establishments along that world-famed thoroughfare are installing additional electric lights. The most magnificent place of this character is "Warwick's Saloon." This is located at the corner of Thirteenth street and Pennsylvania avenue, and is considered one of the most elaborate and complete private saloons in the United States in its interior. The place has just been thoroughly gone over, painted and decorated throughout under the direction of its proprietor, entirely from an electrical point of view, Mr. Warwick having gone to New York and Chicago to obtain some of the unique ideas incorporated in the electrical get-up in his place. White and gold has been used lavishly, and more electric lamps are used here than in any other private establishment in Washington.

The United States Electric Lighting Company will furnish nearly all of the power for the illumination on the night of March 4, although there are a number of places which will receive their supply of current from isolated plants.

GEORGE H. DRAPER.

Washington, D. C., Feb. 20.

PERSONAL.

Mr. P. H. Alexander, who is known to every electrical man, has returned from a long European trip.

Mr. Joseph E. Lockwood, president of the Michigan Electric Company, Detroit, Mich., spent a part of last week in New York city.

Mr. Thomas D. Lockwood, of Boston, the eminent patent authority of the American Bell Telephone Company, was among the visitors to New York city last week.

Mr. J. A. McCoy, of Boston, superintendent of construction for the New England Telephone and Telegraph Company, visited New York city last week on his way South.

It is understood that Prof. F. B. Crocker, of the Crocker-Wheeler Electric Company, New York city, will be the next president of the American Institute of Electrical Engineers.

Mr. Gardiner C. Sims has resigned as treasurer and manager of the Armington & Sims Engine Company, his resignation having been accepted at a meeting held last week. Mr. Sims is one of the most widely known and ablest members of the steam engineering field, and his retirement will be universally regretted if he should decide to make it permanent. The ELECTRICAL REVIEW extends cordial best wishes to Mr. Sims, and hopes he will soon re-enter the field, where his work has been so important.

THE X-RAY PHENOMENA AND THEIR USEFUL APPLICATION.

BY CARYL D. HASKINS, BEFORE THE NORTHWESTERN ELECTRICAL ASSOCIATION, JANUARY 21, 1897.

The general public at first accorded to Professor Roentgen's discovery little but ridicule, but among scientific men Professor Roentgen's experiments were speedily confirmed, and it was not long before the whole world rang with his praises.

The phenomena noted by Professor Lenard in 1894, when experimenting with vacuum tubes, were called to mind; and the older facts of photographs taken through sheets of vulcanite, and photographs taken of hot objects in an absolutely dark room, were cited over and over again. That these phenomena were closely akin to those of the X ray we can not doubt, but we should remember that all great discoveries have been foreshadowed, and we should not, I think, rob Professor Roentgen of one iota of credit for his work because of these few early steps toward the path which he has so persistently and successfully followed.

Following quickly upon the discovery of the X ray came that of the fluoroscope, which enabled us to see with our own eyes the same shadow-like image which Professor Roentgen and others had already succeeded in printing upon sensitive plates.

I am not going to tell you what the X ray is, for the very simple reason that I do not know. That it is not a true light ray, in the sense that we appreciate light, we know; that it is very, very closely akin to light rays is, I believe, now generally accepted.

All that I shall attempt to do is to cite a few of the many applications of the X-ray phenomena which have already been made to serve useful purposes, to show you some of these X-ray phenomena with apparatus which I have here installed, and also to show you by means of the stereopticon a series of actual photographs, mostly of surgical cases.

You all, of course, know that the X rays are produced by the discharge of a high-potential current through a glass bulb exhausted to a high vacuum, the discharge within the bulb taking place between two electrodes placed just as you see them here in this tube.

Again, you all assuredly know that it is pretty well established to day that the X ray can not be refracted, that it always tends forward in its initial direction until absorbed by the mediums through which it passes. Different materials vary greatly in their permeability; *i. e.*, the Roentgen rays are absorbed with vastly greater rapidity by certain materials than by others. Hence the X-ray photographs and fluoroscope image. Such materials as metal, with the exception of aluminum, limes and silicates, as, for example, bones, glass, porcelain, etc., and a large number of other dense materials, are highly impermeable, but in varying degrees. Many compounds of carbon, and almost all organic substances not chiefly composed of limes or silicates, are relatively highly permeable. For example, in photographing the hand the rays are thrown upon the hand, pass through the flesh with comparative ease, and strike upon the sensitized plate. Those rays, however, which fall upon the bones of the hand do not penetrate with similar facility, the result being that we have upon the plate the equivalent of a shadow, the plate being highly acted upon by the rays which pass through the flesh of the hand, and but little acted upon at the points beneath the bones, since the rays have not penetrated the bone with anything like similar intensity.

It is quite possible to have too great a penetrative force when using X-ray apparatus. We may, for example, and to resort to the use of electrical terms for a moment, have a flow of X rays of so great a potential that the difference between the resistance offered by flesh and bone is relatively trivial, with a result that pictures taken under such high intensities lack sufficient contrast between the flesh and the bone; and this can not be entirely eliminated by shortening the exposure.

In the fluoroscope we meet a class of phenomena differing somewhat from those of which we take advantage in making photographs.

It has been discovered that certain substances become fluorescent under the action of the X ray, just as luminous paint, for example, becomes fluorescent under the action of ordinary daylight. There is not so much difference between these two phenomena as one would suppose. The luminous paint retains its fluorescence, and we are enabled to take it into a dark place and observe it. The various substances used in fluoroscope have the property of becoming fluorescent under the influence of the X ray, as I have said; that is, they convert X-ray energy into light energy. With this fact in mind, the governing principle of the fluoroscope becomes very plain. We have, for example, here a sheet of cardboard forming the bottom of a light, tight box, with aperature for the eyes. This sheet of cardboard is coated on the inside with a layer of fine crystals of a material possessing the property of fluorescing under the X rays. In this case the substance used is calcium tungstate. Many materials possess the property necessary, even some very common ones, powdered glass, for example; but calcium tungstate has been found to be about the best for practical use.

Now, as to the operation of the fluoroscope. Suppose a hand be placed upon the outside of the cardboard sheet which carries the fluorescent substance; then suppose the X rays be allowed to play upon this hand; and suppose, also, that the eyes of the observer be applied to the aperature provided. The X rays pass through the flesh of the hand with but little absorption. They pass on always in their initial line through the cardboard, and they strike the crystals of tungstate of calcium carried by the cardboard. These crystals immediately become luminous with a grayish white light. Through the bones the X rays penetrate with much greater difficulty; hence beneath the bones there is but little luminosity of the crystals. The result is that what the eye sees resembles a shadow, darkest where the bones occur and relatively very faint beneath the fleshy tissues.

The same application of the fluoroscope which can be made to the hand can, of course, also be made to any other portion of the human body. With powerful apparatus, a good Crookes tube, and eyes well prepared by a period of rest in complete darkness, the chest cavity can be very completely and plainly examined, the heart can be seen at work, and the entire bony structure is well revealed.

Foreign substances imbedded in the flesh can, as a rule, be quickly detected and located either by the fluoroscope or by photographs. Bullets, pieces of glass or metal, pieces of shattered bone, and all other substances which are opaque to the X rays, can be discerned with little or no difficulty.

It is this application of the X-ray phenomena which has, up to the present time, proved to be of the most practical use. Already we may safely claim that no inconsiderable number of lives have been saved by the speedy locating of bullets and the like.

It is not alone in surgery, however, that the X-ray phenomena find a useful field. In medicine, also, successful application of them has been made, especially in locating tuberculosis colonies in the lung tissues. The lung tissues, when in their normal condition, are probably more transparent to the X rays than is other flesh, whilst, fortunately, for the sake of consumptives, tuberculosis spots are relatively opaque. One can, therefore, readily detect with the fluoroscope, and still more readily by photographic means, little dark spots in the lung tissues which indicate the presence of these bacteria.

In the arts we may expect that the X-ray phenomena will speedily be put to many useful applications. In the inspection of gems alone the X ray is very useful. Diamonds, for example, are practically transparent to the X ray, while all known forms of paste are quite opaque. It is, therefore, but the work of an instant to detect by means of a fluoroscope the falsity of even the best imitations; and this same holds true with a large number of the other precious stones.

It is my belief, too, that quite successful rough analyses of coals can be accomplished by means of the fluoroscope. The density of the shadow of a coal sample, viewed through the fluoroscope, is dependent upon the percentage of ash, and by matching the shadow of the sample under investigation with that of a sample of coal of similar size of thickness, and with a known percentage of ash, speedy and probably quite accurate results may be obtained.

In the inspection of all classes of small merchandise the X-ray apparatus will probably some day come into general use. Objects of all kinds, when composed partly of metal or other relatively impervious substance, and partly of some relatively permeable material, can be examined with the greatest certainty. There is no difficulty, for example, in determining just how deeply a screwdriver is set into its handle, or just how long the fastening screws or nails are in a box. So, too, parcels or mail packages can be examined quite successfully without being opened. Possibly this hint would not be misplaced if gently communicated to the United States Custom House.

Are the X rays injurious? Second, will the X rays cause the blind to see?

Replying to the first question, much depends upon one's own definition of the word "injurious." That the X rays do produce a certain unpleasant effect upon the skin can not be denied. To produce this effect long and very frequently repeated exposures have to be made. In my experience, I have heard of no case of X-ray burn save amongst those who have been engaged in constant experimental use of the apparatus, generally being exposed to the X rays for a good many hours each day during a quite extended period. The effect itself differs very slightly, if at all, from severe sunburn. In mild cases the skin becomes rough and gradually peels off, the sensation being that of burning and itching, just as if one had been exposed to a strong Summer sun without being accustomed to it. In some few severe cases which I have seen unpleasant blisters have been produced, causing the skin to become sore for a time, but healing just as any other burn would, and leaving no unpleasant after effects.

Evidence seems to indicate, however, that the X rays themselves are not responsible for these cases of X-ray burn, and we are, I think, quite safe in assuming that the effects are due to some other rays which are produced in the Crookes tube, possibly the violet or the lower ultra-violet rays. Just such effects, to a less degree, have been produced by a long exposure to intense arc light, and possibly some of you have experienced such arc-light burns.

Now, as to the question in regards to blindness. To the straightforward question, Will the X rays enable the blind to see? I answer, No; I think not. In certain forms of blindness a certain amount of visual sensation is certainly produced, but it scarcely amounts to seeing. It applies only to a very limited class of blindness, and the effect is probably not due to the X rays at all. In my own experience, I have known or heard of no case of successful experiment in this direction, except upon individuals suffering from some form of paralysis of the optic nerve. Where the optic nerve is absolutely dead or absent, I do not think that any sensation of vision whatever can be produced. I have personally experimented upon but one case of blindness. The subject, in this case, was suffering from a complete paralysis of the optic nerves. His eyes appeared to be quite normal, but he could not detect the light from an arc lamp immediately before his face. He had been completely blind for two years.

Upon being placed before the X-ray apparatus he saw and described the general outline of the Crookes tube in use, which, by the way, was of rather an unusual shape. He described what he saw as a faintly luminous and decidedly blurry spot. He also saw two very faint luminous lines leading away from the two ends of the tube. These were the two luminous lead wires arranged just as you will see them arranged in a few moments. It is quite obvious that the visual sensation which he experienced could not have been due to X rays, for no X rays emanate from the lead wires. Furthermore, a large sheet of cardboard, placed between the subject and the apparatus, shut off everything completely. Hence we are, I am sure, very safe in saying that the penetrative X rays had nothing to do with the phenomena, for X rays pay no attention to cardboard.

Oddly enough, this subject, although he saw the luminous lead wires, failed absolutely to detect anything when I let the full discharge flow across the main air gap, as I shall do when starting up this apparatus.

This subject saw and described the general shape of irregular figures and letters cut from cardboard and held close in front of the tube. He described their appearance as being that of vague, dark shadows against the lighter ground, although I was perfectly satisfied that in this particular case, at least, what the subject saw was light; that is, I believe he was not literally and perfectly blind, but that his optic nerves still remained sensitive to certain portions of the spectrum, portions which in ordinary life would never fall upon his eyes. In short, I believe that his sensations of sight were due to some narrow line of rays high up among the ultra-violets.

I am now going to show you a collection of lantern slides made direct from X-ray photograph negatives, kindly loaned me for this occasion by Dr. E. A. Codman, of Boston, who has succeeded in doing some of the most remarkable work that it has been my good fortune to see. After showing you the slides I will put this X-ray apparatus in operation, so that all who wish to may examine it, and their own bones, too, if they like.

HEATING AND COOKING BY ELECTRICITY.

ABSTRACT OF PAPER READ BEFORE THE NORTHWESTERN ELECTRICAL ASSOCIATION, JANUARY 21, BY GEORGE CUTTER.

The principles leading up to heating by electricity are exceedingly interesting, involving as they do the latest ideas of our physical forces and their mutual relations. In designing apparatus for electric heating and cooking it is necessary to consider all the laws of heat—its conduction, insulation, absorbtion and convection—as well as those of electricity. The question of latent and specific heat must be carefully weighed when designing electric heaters or cookers for special purposes. A pound of water will absorb much more heat in a rise of 100 degrees temperature than will a pound of copper or iron. This means that the electric heating of water (except for very small doses) is much more expensive than the electric heating of sadirons, griddles or broilers, which immediately pass the heat on to the purpose for which it is needed. Therefore, when you equip homes with complete electric-cooking outfits, as you should now begin to do, it will be advisable to recommend some other means of heating water except in small quantities. By doing this, all the cooking of a family can be done economically by granting special rates for the current, as you can well afford to do.

The economy of electric heating and cooking depends upon the construction of the apparatus, so that your heat is all concentrated upon the special work in hand and for the minimum of time possible to do this work. Do not let any of the heat go anywhere else than where used, and do not make the heat before thoroughly ready to use it, and be sure to shut off the heat-making current at the earliest possible moment. By careful attention at the hands of the central station manager, your customers can learn how to use the current economically, and when this is done the supreme convenience and comfort of this method of cooking will cause its spread to such an extent as to enable many central stations to run their machines all day. What has been said about designing the apparatus applies with equal importance to its selection.

I am going to call your attention to a few of the many appliances now ready for your work. Sadirons: There is now ready quite a large line of these, and they are very satisfactory and economical to operate. I will mention a few sizes and give the current consumption, so you can figure the charges to make for the current. A six and one-half-pound iron for common household use requires four amperes on a 110-volt circuit. This iron for laundry use, where the work is to be rushed, would require about five amperes, or possibly six amperes. A polishing-iron requires two and one-half amperes on 110 volts. An 18-pound goose-iron requires five amperes on 110 volts. The other sizes and special designs that manufacturers use require more current for given weight of iron than those made for household work.

One of the most convenient little devices for the home, the office or the shop is the four and one-half-inch plate stove, with stew-pan to fit it. This stove requires 1.9 amperes on 110 volts. It will be hot in about two minutes, and will be so very convenient that several of them on your circuits will increase the load quite appreciably. There is also a larger disk heater, six inches diameter, with switch attachment, which requires 5.5 amperes on 110 volts. A single griddle requires about the same current, and will cook griddle cakes for breakfast without any time lost fixing up a fire. A three-section griddle would be needed for cooking for several persons. This requires six amperes on 110 volts. One fascinating device to the housewife is the chafing-dish. This requires four amperes on 110 volts. You can well afford to distribute some pamphlets upon the use of the chafing-dish, as few housewives are informed of the great amount of cooking that can be done with it.

A five o'clock tea-kettle is also made which requires five amperes on 110 volts, and the lady can make the tea in the finest reception-room without any smoke, heat or fumes. A four o'clock tea-kettle requires seven amperes. For cooking food in boiling water and for heating water for special work the most practical device is the immersion coil, which takes four, five, six and eight amperes, according to its size. All the heat of such a coil is applied to the very best advantage, and its uses are many and varied. The heating pad is a great convenience, as a warm pad can be instantly applied in case of sickness. It uses only four-tenths amperes on 110 volts, and will often give relief worth almost any price. The ladies will also enjoy the curling-iron heater, which only requires four-tenths amperes on 110 volts. It is furnished with an automatic switch, so the current is shut off when the iron is removed.

I am unable to make suggestions as to what rate should be made for heating current, as this will vary with local conditions. The plant that has such a demand for motors and lights as to very nearly make it pay to run all day can afford to give very favorable terms for heating current, so as to enable them to start the all-day practice. The growth in demand, after the practice is once well started, will soon yield good profit. Some stations that run all night will offer to run late in the morning, to enable patrons to cook the breakfast, and by gradually extending the time, with the increase in use of electric heating, until the plant runs all day and night, earning dividends every hour, instead of trying to earn them in a few hours each day. The development of electric heating, as applied to welding and heating of metals, electric furnace work in the manufacture of aluminum, carborundum, calcic carbide, etc., has been enormous, but is of little practical value to the central station manager. It is destined to interest him, in the near future in the growth of the use of acetylene gas, but the electrician will keep ahead of the procession. Let me close with a few statements which seem to be timely:

1. Every central station manager should familiarize himself with the well developed heating and cooking apparatus now on the market, so as to be ready to talk it to his customers.

2. He should arrange to show the apparatus in operation, so as to create a public interest in it.

3. He should study the question of rates, so as to be able to offer special inducements to a more varied use of current.

4. He should educate his patrons to use the current economically, for therein lies the secret of expanding the use of heating apparatus.

5. And last, but not least, he should insist on the use of devices which are efficient, and whose durability is practically vouched for by the standing of the manufacturers.

DISCUSSION.

Mr. Lord: The thing that would bother us would be to get our customers to buy these utensils. We run our plant by water power, and have 225 or 230 horse-power. When morning comes we turn off the power, and all that water power goes to waste during the day. For $25 a month I could hire a man to stay at the station and run that wheel, and every cent that I could get per month, over and above $25, less the wear and tear on the machinery, would be profit. Now, it occurred to me that here are all these different utensils that Mr. Cutter speaks of, that can be used for cooking and heating, and if these companies that manufacture these articles could produce them so that they could be sold at a fair figure, or at such a figure as could enable us to handle them, I have no doubt that I could put in a great many of them right in the city of Waupaca. But the result of our not having any such thing is that we shut our wheel off at daylight, and that 225 horse-power, sad to say, goes to waste. I think the subject is well worthy of thorough investigation.

Mr. Cutter: I am fully satisfied, however, that the subject is of great importance to every station manager, and should be taken up now. If you carefully pick out your apparatus and see that it is doing its work properly, that the current is put just where you want it, when you want it, and at no other time and place, you can do cooking marvelously cheap and with a convenience that commands the respect of the housewife, and if she wants the apparatus she will see that it is bought. A successful plant in one house, doing all the cooking for the house, is a great advertisement. Of course, it is necessary to use some other means to heat large quantities of water, which by the electric method is expensive. But when you have a house equipped to do all cooking by it successfully and economically, the news will sweep through the community like a wave; and if you will fix up an exhibit, and cook by it, you will reap much benefit from the advertisement. The matter is extremely practicable.

Mr. Thayer, of Belle Plain, Iowa: This question of electric heating, brought up by Mr. Cutter, suggests another means of providing a day load for our stations, to avoid loss in the interest on the investment and the depreciation charge resulting from the plant lying idle. The amount of revenue that small plants receive in small towns is, as a rule, not sufficient to make it advisable for station managers to make the start of running all day. Now, if they are so situated as to be able to obtain soft coal at comparatively low prices, while anthracite coal is comparatively high, they can, by the newer methods of heating with exhaust steam, put in a system by which they can heat buildings within a radius of a quarter of a mile with steam pipes much smaller than are used under the old-style gravity system, and that, too, with no back pressure on the engine. I speak advisedly on this subject, as I have been in the steam-heating business. Now that, at the start, gives a station employment for a day load for six months in the year, and if they are running six months for steam alone, they can just as well run one of their smallest engines for power, and that will go a very long way towards solving the problem of getting a day load. This may be a little off the main question, but the facts and figures may be interesting now. An ordinary store, say 25 feet wide, and a 14-foot ceiling will take about 250 square feet of radiation.

Mr. Lord: How deep?

Mr. Thayer: That is of no great importance. If you once get your store warmed up, all you have to look after is the loss of heat. You can keep a square foot of surface warm for a month, at the expenditure of about 10 pounds of coal having an evaporative power of six pounds of water to one pound of coal, and that certainly is poor coal. Eastern grades of coal will evaporate 9 or 10 pounds, and anthracite coal sometimes 11 pounds. That will give you, on a basis of five months' lighting, 50 pounds of coal. Now, if you have no power at all you can run your heating surface for about 25 cents per square foot. That will bring the bills a little less than what it will take to heat your store with anthracite coal. If a man puts in steam-heating apparatus, with soft coal, you can not compete with him, of course, except on the score of convenience. With coal at $1 per ton, it will cost about 10 cents per square foot, and you can get about 25 cents. If your coal costs $2, you see, it will cost you 20 cents per square foot, leaving you only a margin of five cents. That is on the basis of not furnishing power at all. Now, if you are running all night, your exhaust steam contains practically the same amount of heat, and you can furnish it without increased operating expenses, though you will have comparatively heavy expenses for your steam mains. But I think that with that plan of heating, together with your small power employed, as Mr. Cutter suggests, you can work up a revenue which will be quite satisfactory.

Mr. Harding: I think the question of using exhaust steam is a very important subject for central station men. We have got to find some method of maintaining our central stations. One of the easiest ways of doing that, it seems to me, is, if possible, to utilize the material that we are throwing away. I would like to ask the gentleman to what he refers when he speaks of "square foot." Does he refer to radiating surface or exposure?

Mr. Thayer: I referred to the square foot of steam surface, and one square foot of steam surface will heat two square feet of glass, and eight square feet of ordinary wall will equal one foot of glass. That is the way those things are figured; that is, ordinary brick construction, with furred walls. Stone and thicker walls cut it down lower. One square foot of radiating surface will condense one-third of a square foot per hour. That is all the data necessary. In 25-foot stores it costs them $25 to $35 for hard coal for the Winter. We can get those stores to heat in our city. I have talked with a great many people there, and they are perfectly willing to pay, even in hard times, when they are making no money, $50 for a 25-foot front. You give them better service for a little more than what it costs them to use stoves. A six-inch main will carry away all the steam from a 100-horse-power engine if the distance is not too great for that service. The theory of the whole system is that you have at your radiator a thermostatic valve which closes as soon as steam reaches it, but will take out water and air, which are pumped back by a return and a partial vacuum maintained, and you are sure of getting steam into your farthest radiator; and on warm days you do not have to maintain full steam pressure. You can maintain a pressure of, say, seven pounds absolute—that is, 15 inches of vacuum—and that will give you a temperature of about 150 degrees, and during the daytime, when you have to supply more or less live steam, you will not have to supply so much, because your radiating surfaces are not so hot. Five years ago the system described was in a comparatively immature state,

but in recent years it has been very much improved, and I think I may say that the thermostatic valve is to-day a reliable article. One of the first central station plants in Chicago was put in the Northwestern depot, and during this last cold snap, where they had to carry five and ten-pound steam pressure, they heated their entire building in the windiest weather without an ounce of back pressure, although their plant is situated at quite a distance from the depot building. In the Northwestern depot, in Milwaukee, there is a Corliss engine, and the engineer told me, only last night, that it takes 10 pounds pressure to heat the building, but he does not use his exhaust steam. If that building were equipped with the new valves and pipes, it could be heated by the exhaust steam without any difficulty, and without back pressure.

The American Street Railway Association.

The executive committee of the American Street Railway Association met at the Prospect House, Niagara Falls, on Monday, the 15th, to perfect arrangements for the sixteenth annual meeting to be held at the International Hotel, October 19–22, 1897. The following members were present: President Robert McCulloch, of St. Louis; Charles S. Sergeant, of Boston; D. B. Dyer, of Augusta, Ga.; C. F. Holmes, of Kansas City; H. P. Bradford, of Cincinnati; George B. Hippee, of Des Moines, and Secretary T. C. Penington, of Chicago.

The committee met Hon. W. Caryl Ely, president, and Burt Van Horn, general manager, of the Buffalo & Niagara Falls Railway Company; Henry M. Watson, president, and H. H. Littell, vice-president and general manager, of the Buffalo Railway Company; Charles B. Hill, treasurer of the Niagara Falls & Suspension Bridge Railway Company, and President Brinker, of the "Great Gorge Route;" also Mayor Arthur Schoellkopf and Messrs. W. S. Humbert, A. J. Thibadeau, E. T. Williams and W. H. Beardsley, of the Chamber of Commerce. It was arranged with the gentlemen of the Chamber of Commerce that the convention hall, which they are to erect, shall be completed by the time of the meeting. This hall will afford 20,000 square feet of level floor space, with a meeting room in the same building. There will be a steam railroad siding direct to the door, saving all expense of drayage.

There were also present at the public meeting in the rooms of the Niagara Club Messrs. H. H. Windsor, *Street Railway Review*, Chicago; L. E. Myers, treasurer Electrical Installation Company, Chicago; A. S. Littlefield, Chicago, and D. B. Dean, Terre Haute Car and Manufacturing Company.

The party rode over the Gorge Route and visited the power plants of the Falls Hydraulic Power and Manufacturing Company and Niagara Falls Power Company. On Tuesday morning a trip was made over the road of the Buffalo & Niagara Falls Railway to Buffalo, and the company entertained at dinner by Messrs. Watson and Littell, after which the powerhouse of the Buffalo Railway Company was visited.

The business meetings of the committee were held in executive session, and ample provisions made for a successful meeting next Fall.

VOLTAIC BATTERIES ARE THERMO-ELECTRIC.

To the Editor of Electrical Review:

In the early part of the present century a great controversy was maintained among philosophers concerning the true cause of the generation of the current of electricity in the galvanic or voltaic pile or battery. Volta, Zamboni, Pfaff, Matteuci and others ascribed the generation of the electric current to the contact of dissimilar substances, while Faraday, Harris, De la Rive, Roget and many other very able philosophers ascribed the generation of the electric current to chemical action in the battery. Sir Humphrey Davy believed that the electric current was caused partly by the mere contact of dissimilar metals, and partly by the chemical action which occurs in the battery. Lord Kelvin, late Sir William Thomson, has demonstrated that the difference of potential between two semirings, one of copper and the other of zinc, in contact with each other is due to contact merely. Balfour Stewart considers that there is a sort of electric irritation kept up at the junction of the two unlike metals, which acts as a sort of predisposing cause in the determination of an electric current, and that the great amount of energy manifested by a voltaic battery is due to chemical action.

It has occurred to the writer that the action of voltaic batteries should be ascribed immediately to the heat generated by chemical action in the battery. By the union of sulphuric acid and zinc, for example, in the battery a salt is produced and heat is generated. Part of this heat is transformed into electricity when the circuit is closed, and this electricity may do work in the circuit either in supplying electric lamps with current, driving electric motors or firing blasting cartridges. Part of the heat, however, is not transformed into electricity, but is expended in raising the temperature of the liquid and the plates in the battery; also in heating the conducting wire always to some extent. The heat in the battery which is not transformed into electricity is carried away into space by convection air currents moving over the surface of the liquid and the plates in the battery. The plates become heated, but unequally so, and heat is carried along their masses and dissipated in the air by convection and radiation. One of the plates becomes heated more than the other, because the chemical action occurs on only one. We have, then, two unlike metals at different temperatures having a liquid conductor interposed between their surfaces. Here are conditions sufficient, it appears to me, to cause the generation of a current of thermo-electricity.

Holding this theory, I propose to use two plates of similar metal which will not be attacked by the acid or saline solution into which the plates are plunged. One of the metals should be heated by some external means, while the other may remain unheated. On joining the terminal wires attached to these two plates, I should expect to find that a current of electricity would be generated and would flow along the wire. In this experiment the dilute sulphuric acid would be used, not for the purpose of attacking any metal, but merely because it is a comparatively good liquid conductor of electricity, permitting the electric current to flow freely from one plate of the battery to the other, usually from the hotter to the colder plate, through the acid.

The remarkable experiments which were made last year by Dr. W. W. Jacques, of Boston, Mass., were by him believed to show voltaic action between the fused caustic soda and carbon plates in his generator. He had iron retorts in a furnace, and these retorts contained caustic soda, through which a blast of air was mechanically forced. It was found that the carbons underwent a slow combustion, and to this fact Dr. Jacques ascribed the production of the voluminous current of electricity which was generated by means of his battery. Mr. C. J. Reed has recently proves that the electric current in Dr. Jacques's battery is purely thermo-electric. Mr. Reed showed that an electric current could be generated by melting caustic soda in a sheet-iron vessel and causing an iron plate to dip into the caustic soda. A current was generated which flowed from the iron vessel through the fused caustic soda to the suspended iron plate, then from the iron plate along a wire to the iron vessel. Here, then, a thermo-electric current was generated which appeared to be due to the fact that the iron vessel was hotter than the iron plate which was suspended in the fused caustic soda. Mr. Reed tried plates of different metals in the fused caustic soda, but the highest electro motive force which he obtained was 1.15 volts when an iron plate was used. Here, then, there was shown in action a battery in which the liquid exerted no chemical action and in which similar metals were used, whereas it is usual in thermo-electric experiments to use at least two different metals.

Batteries may probably be constructed on principles similar to those of Mr. Reed, except that dilute acid solution may be used instead of fused caustic soda. The metals used should be such as can not be chemically attacked by the dilute acid or other solution, even when the same is hot. One of the plates should be artificially heated, while the other should not.

In Dr. Jacques's battery the function of the air blast appears to have been misunderstood, because Mr. Reed produced similar effects by the use of coal gas instead of air. The blast was useful merely for its cooling action on the plate in the cell.

Should the theory of the writer be sustained by further experiment, it would seem that the art of generating electricity directly from coal or other cheap fuel will have received considerable advancement. When we know that the zinc hitherto used in voltaic batteries has constituted a costly fuel, which is acted on by the dilute sulphuric acid or other liquid in order to produce heat, which then at once becomes transformed into electricity, and when we believe that a metal plate heated by some less costly means, and which can not be attacked by the dilute acid or other liquid in the cell, may be used to generate electricity, we shall cease to consume zinc and sulphuric acid in our batteries. In the case of using sulphuric acid, hydrogen would probably be liberated, but this would be restored from the water in which the acid is diluted. It would be necessary in such a battery only to furnish coal or other cheap fuel, and to add a little water occasionally to the dilute acid in the battery.

The successful solution of the problem of getting electricity directly from coal, it seems to me, will soon appear. It is, perhaps, too much to expect, as some scientists do, that it will soon be possible to utilize 75 per cent or more of the total heat energy of coal as electrical energy. How great the percentage which we shall secure may be I shall not now predict, but I shall simply state that, should we secure only 15 per cent of the total energy of the coal as electrical energy, the steam engine would soon terminate its own existence and the electric motor would take its place.

James Asher.

Dunnville, Ont., January 28.

TELEPHONE NEWS AND COMMENT.

Charles E. Buell, of Plainfield, N. J., has patented a new telephone system, claiming special simplicity and economy in construction.

Erie Telegraph and Telephone Company made a net gain of 165 subscribers in January. Total number connected February 1, 21,554.

Mr. Chas. J. Glidden, of the Erie Telephone Company, is spending several weeks in Texas looking over the property of his company and arranging for extensions and improvements.

The ably managed Missouri & Kansas Telephone Company, Kansas City, Mo., paid its quarterly dividend to January 1, 1897, on February 20. The officers of this company are J. R. Mulvane, president; N. R. Ferguson, secretary; A. Burt, treasurer.

At the annual meeting of the Ohio Valley Telephone Company, of Louisville, Ky., Mr. J. B. Speed was elected president; James Clark, vice-president and treasurer; H. N. Gifford, general manager and assistant treasurer, and W. H. Mundy, secretary.

The board of directors of the Wausau, Wis., Telephone Company has decided to make a reduction in rates for telephone rental after May 1. The new rates will be $2.50 per month for business houses and 75 cents per month for residences. The exchange is said to be clearing up $230.70 per month.

The annual report of the Wayne Telephone and Telegraph Company, of Clyde, N. Y., shows the assets to be $2,900, liabilities, $10.72, and that the income for the past year has paid all expenses. In the Spring the company will increase its stock and install exchanges in Lyons, Palmyra and Newark, and extend its plant.

ITEMS OF INTEREST.

Prof. E. P. Roberts, of Cleveland, Ohio, visited New York city last week.

The by-law to purchase the Saugren, Southampton, Ont., water power and install an electric light plant has received the sanction of the ratepayers.

An electric light and power plant building, at a cost of about $950,000, is to be constructed by the Edison Electric Illuminating Company of Brooklyn, N. Y.

Mr. William Taylor, who won the *Evening Telegram's* election-guessing contest, has accepted the prize of a three months' trip around the world, and expects to begin his "globe trotting" about July 1. Mr. Taylor is at present manager of the Hart & Hegeman Manufacturing Company's New York office.

ELECTRIC LIGHT FLASHES.

Fostoria, Ohio, has offered a bonus of $10,000 to secure an incandescent lamp factory.

The Newark, N. J., Electric Light Company's temporary power-house has been destroyed by fire, at a loss of $6,000.

The earnings for January of the Edison Electric Illuminating Company of New York, including the high-tension systems, were as follows:

	1897	1896	Inc.
Gross,	$240,299.05	$218,181.54	$22,117.51
Net,	124,543.50	106,855.20	17,688.30

The Electric Light Company, of Perry, N. Y., report a capital stock of $25,000; actually issued, $9,000; debts, $21,000; assets, $35,000. The directors elected for 1897 are M. H. Allin, G. K. Page, E. D. Page, Mary C. Page and C. M. Smith.

The stockholders of the electric light and power company of Sisterville, W. Va., at their annual meeting elected the following directors: H. A. Wright, W. G. Kohl, Geo. W. Stocking, C. A. King, E. A. Durham, W. J. Neuenschwander, Henry W. McCoy, C. F. Hasford and John C. Morrison.

The city of Pittsburgh has secured a temporary injunction against the Pittsburgh, Frontenac & Suburban Electric Railway Company to prevent said company from operating an electric lighting plant in that city until said company has built the road to Chicopee.

Judge Cox has refused to grant the District Commissioners an injunction against the United States Electric Lighting Company, of Washington, D. C., enjoining the company from maintaining certain overhead electric lighting wires on C street, between Sixth and Seventh. The judge held that the wires are not new additional ones, as claimed by the commissioners.

The Utica, N. Y., Electrical Manufacturing and Supply Company has been awarded a contract for furnishing a modern lighting plant for the Walcott & Campbell Spinning Company, of New York Mills. The plant will consist of an 800-light Eddy incandescent dynamo, 45 of the Manhattan inclosed arc lamps and 262 Buckeye incandescent lamps, together with a switchboard.

The Empire Light and Power Company, of Quincy, Ill., at their annual meeting elected the following directors: W. H. Channon, H. O. Channon, Loren Wheeler, Harry E. Bake and L. C. Seymour. The officers as elected by the directors are as follows: President, W. H. Channon; vice-president, Loren Wheeler; secretary, Harry O. Channon; treasurer, Harry E. Bake.

The People's Electric Manufacturing Company, of Monongahela City, Pa., with a capital stock of $50,000, has completed its plant at Speers station. It will supply electricity for lighting purposes to Charleroi, Bellevernon, Fayette City, Coal Center and California. The plant is equipped with three engines, 150, 100 and 30-horse-power, respectively, and three 100-horse-power at 80-pound boilers. The main line is about eight miles in length, and has a capacity of 5,000 16-candle-power lamps.

The electric light company, of Hardwick, Vt., has refused to light up that village at night, because of trouble between the company and the village. The company has failed to fulfill its contract in not furnishing full 30-candle-power lights, and the village has refused to accept the service as not being up to contract. The village will oblige the company to remove its poles and wires, which were set with the understanding that the company should furnish 30-candle-power lights every night in the year.

There is a bill now pending before the New York Legislature which authorizes cities to secure gas and electric light franchises now held by private individuals by condemnation proceedings, and the hearings before the committee are animated and interesting. A comparative statement of the advantages of municipal lighting by electricity was made to the committee, claiming the saving per light as follows:

	Before.	After.
Bangor, Me.....	$150	$48
Lewiston, Me.....	182	55
Peabody, Mass.....	185	52
Bay City, Mich.....	110	58
Huntington, Ind.....	146	50
Goshen, Ind.....	156	77
Bloomington, Ill.....	111	51
Chicago, Ill.....	250	96
Elgin, Ill.....	266	43
Aurora, Ill.....	326	70
Fairfield, Iowa.....	378	70
Marshaltown, Iowa.....	125	27
Jacksonville, Fla.....	24	5

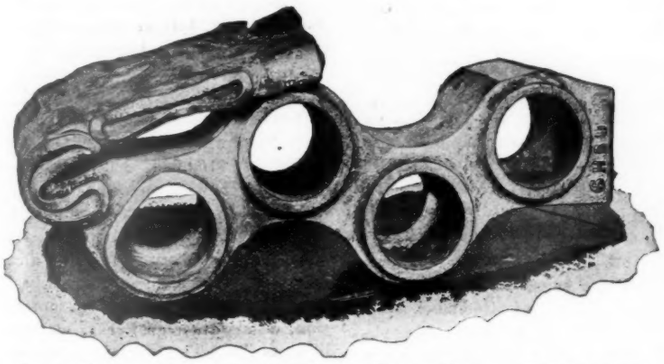

FIG. 1.—SHOWING TEST OF SIX-TUBE BOILER HEADER MADE OF "FLOWED" STEEL.

"Flowed" Steel.

The two illustrations show samples of a new departure in the art of making alloys or mixes for high-grade steel castings. Something over a year ago the Aultman & Taylor Machinery Company, of Mansfield, Ohio, started to have a series of experiments made, with a view to obtaining a mix for steel castings which should equal, if possible, in its chemical and physical properties the best boiler plate steel. After a long series of expensive trials a mixture was discovered which gave wonderful results.

Owing to the high price of some of the alloys used, castings made by this process are very expensive, costing from six to eight cents a pound in the rough; but, for the particular purpose for which they are designed, it is much cheaper to use, even at this price, than the ordinary steel castings at less than half the cost per pound.

Castings made by this "flowed" steel process are absolutely free from flaws, defects or blow-holes, and are uniform in their texture throughout. Every piece of the metal is guaranteed to have an elongation of not less than 25 per cent and a reduction in area of not less than 50 per cent, with an eight-inch test piece. Some of the samples have shown an elongation of 31 per cent and a reduction in area of over 60 per cent. The metal can be worked cold as well as, or better than, steel plate.

The basis of the mixture is open-hearth steel of the finest quality. "Flowed" steel is used by the Aultman & Taylor Machinery Company in manufacturing cross-boxes, flanges, etc., in all their Babcock & Wilcox type of boilers. Where this type of boiler is manufactured by them for a working pressure exceeding 225 pounds to the square inch, they also use it in the "headers" or manifolds into which the boiler tubes are expanded.

Fig. 1 shows a header of this type, six tubes high. It will be noticed that the header, for a space of two tubes in length, has been flattened out and then bent back on itself, an experiment that it is extremely doubtful if it can be successfully performed on a steel forging of any description.

A header made in this manner possesses two very material advantages over a header made of forged steel.

1. There is no weld to be made, which avoids one great element of weakness in forged headers.

2. The walls of the header can be thickened at will where the strain incident to its use requires greater strength than at other points. This is especially desirable at all corners in the header, as the strains are greatest there. With the forged steel header the process of manufacture thins the metal at these very points of greatest strain, or an exact reversal of what should pertain to give best results. The same holds true in regard to cross-boxes or saddles on the drums of boilers for the reception of the nipples connecting the drums to the headers.

Fig. 2 shows samples of borings and turnings from castings made under the "flowed" steel process in the ordinary course of manipulation under the tools. These were photographed just as taken from the scrap pile, without any special effort to obtain samples out of the ordinary. The four small straight pieces shown are drillings from a five-eighth-inch hole.

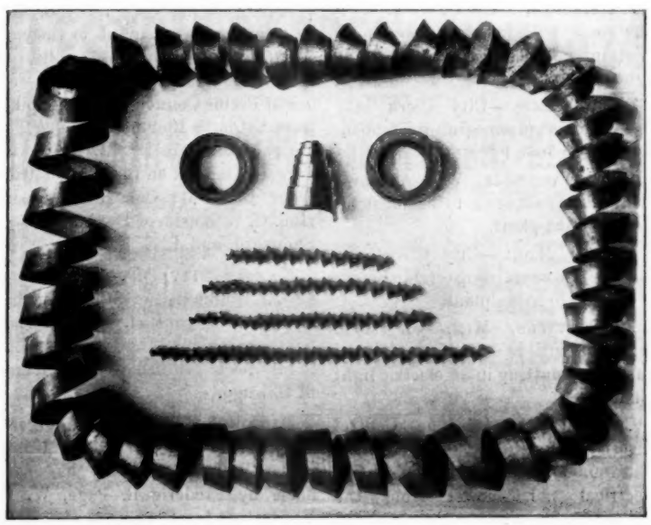

FIG. 2.—BORINGS AND TURNINGS FROM "FLOWED" STEEL CASTINGS.

American Institute of Electrical Engineers.

At the meeting of the Institute, held February 17, 75 members and guests were present. A paper was read by Mr. John W. Howell on "Conductivity of Incandescent Carbon Filaments and of the Space Surrounding Them." The discussion was participated in by Messrs. Kennelly, Colby, Walcott, Sheldon, Wirt and Burnett. At the meeting of the executive committee in the afternoon seven associate members were elected and four associate members were transferred to membership.

The Niagara Falls & Lewiston Electric Railway Company has been mortgaged to the Knickerbocker Trust Company, of New York, for $1,000,000, the money to be spent in wiping out present indebtedness and making improvements.

ADVANCE INFORMATION

Electric Light and Power.

BALTIMORE, MD.—The Catonsville Ice, Light and Power Company has been incorporated by Bernard N. Baker, Victor G. Bloede, Wm. H. Gorman, Chas. C. Macgill, Wesley M. Oler, Hanson Robinson and Conway Robinson. The company will erect a plant for supplying electricity for light and for manufacturing ice, etc. Capital stock, $100,000.

DEER CREEK, ILL.—Town Clerk may be addressed concerning proposed erection of electric light plant.

TAKOMA PARK, D. C.—Town Clerk may be addressed concerning proposed erection of electric light plant.

HOUSTON, TEX.—Address Alderman Street, council, concerning proposed erection of electric light plant.

ARKADELPHIA, ARK.—The Arkadelphia Water and Electric Company has been incorporated, with C. V. Murray, president; E. W. McCorkle, secretary, and W. E. Barkman, treasurer. Capital stock, $50,000.

BARTOW, FLA.—W. H. Towles will construct an electric light plant. Machinery has been purchased.

PENACOOK, N. H.—An electric lighting plant will probably be established at the Valley of Industry, Boscawen Plain.

PITTSBURGH, PA.—U. J. L. Peoples may be addressed concerning erection and completion of electric light plant.

SALEM, MASS.—City Clerk may give information concerning establishment of electric lighting plant.

EAST HARDWICK, VT.—A movement has been begun to establish an electric light plant.

VASSAR, MICH.—City Clerk may be addressed concerning establishment of electric lighting plant.

BARNESVILLE, MINN.—A stock company will be organized for the purpose of putting in an electric light plant.

COLUMBIA, S. C.—The Central Electric power-house, built at a cost of $700,000, and developing 10,000 electrical horse-power from the Columbia Canal, has commenced operations.

LOCKPORT, N. Y.—The plant of the Tonawanda & Wheatfield Electric Light Company has been sold to George Davenport, of Boston, for the shareholders, at $50,000.

PATCHOGUE, N. Y.—Articles of incorporation have been filed with the Secretary of State by the Bay Shore Electric Light Company. Its capital stock is placed at $10,000, and the directors for the first year are Josiah Robbins, Freeman T. Hulse, William W. Hulse, Selah T. Clock, Eugene P. Strong and John R. Howell, all of Bay Shore, and E. B. Mowbray, of Brooklyn.

LEHIGHTON, PA.—An election to vote on the question of issuing $22,000 in bonds for an electric light plant will soon be held here.

NEW BRIGHTON, PA.—A party of capitalists of this place and Beaver Falls are now negotiating for a piece of ground belonging to the Economites at this place, for the purpose of erecting an electric light and power plant to be run by water power. The object is to furnish light for the entire Beaver Valley and power for any of the factories that can profitably use it.

VIROQUA, WIS.—O. C. Stevens may be addressed concerning lighting of almshouse with electricity. The electric wires connecting the asylum and county almshouse have been put up, and new engine and dynamo are here.

ST. LOUIS, MO.—Fred E. Allen, Eugene Benoist and Breckenridge Jones contemplate the erection of an electric light plant.

POINT PLEASANT, W. VA.—J. Friedman & Company desire electric light plant, to be operated by gasoline engine.

MOORESVILLE, N. C.—George C. Goodman desires estimates on electric light plant for city of 1,000 inhabitants.

MARTINSBURG, W. VA.—Address the Mayor concerning $50,000 worth of bonds to be issued for an electric light plant.

New Electric Railways.

DAYTON, O.—The Dayton & Western Traction Company, with a capital stock of $400,000, has been incorporated. The company is organized for the construction and operation of an electric railway from Dayton, O., to the west line of Preble County, on the turnpike, from Eaton to Richmond, Ind. The incorporators are Dr. J. E. Lowes, Surgeon-General on the staff of Governor Bushnell; Col. R. M. Nevin; Hon. C. L. Kurtz, of Dayton; Oscar Sheppard, and J. E. Feight.

KANSAS CITY, MO.—The Metropolitan Street Railway Company has awarded the contract for the electrical equipment of the Rosedale line to the Electrical Insulation Company, of Chicago.

MILFORD, MASS.—Formal organization as the Milford & Upton Street Railway Company has been made by Frederic R. Page, W. C. Vanderlip, Jr., Charles A. Couch, of Boston; A. A. Jenkins and W. D. Leahy, of Milford; Stephen B. Fiske, of Upton, and Appleton P. Williams, of West Upton, as directors.

KANSAS CITY, MO.—The Union Cable road has been sold to Mr. Frank Dixon.

MILWAUKEE, WIS.—The Citizens' Traction Company, which proposes to build an electric street railway in this city under the old Tillotson franchise, is also considering the interurban project of a line down the Fox River valley to Kaunkauna, which was so much agitated a year or two ago.

NEW ALBANY, IND.—The matter of constructing an electric railway along the line of the New Albany and Paoli turnpike from this place to Paoli, and touching at the thriving towns along the line, is again being agitated, and with a fair prospect of the road being built ultimately.

WESTMINSTER, MD.—The project of an electric railroad from Washington city to Gettysburg, Pa., via Westminster, Md., has taken shape so far that a preliminary survey is being made. Among the movers in the project are T. Herbert Shriver, of Westminster; Stilson Hutchins and Francis G. Newlands, of Washington.

PLAINFIELD, WIS.—An electric road will be constructed from Oshkosh, Winnebago County, through Waushara County, to Stevens Point.

New Telephone and Telegraph Companies.

MEMPHIS, TENN.—The Stuttgart Telephone Company has been incorporated, with a capital stock of $2,500. The officers are H. E. Rhodes, president; D. L. Cromer, vice-president; W. S. Gettle, secretary and treasurer.

NEW ALBANY, IND.—Arrangements are being made by the Ohio Valley Telephone Company to extend their lines from this place to Mooresville, Galena, Greenville, Fredericksburg and other towns.

SYLVAN, PA.—A company has been organized here for the purpose of erecting a telephone line from this place to Cove Gap. C. B. Zimmerman is president, Seth J. Zimmerman, secretary, and Jacob S. Zimmerman, treasurer. There is $400 stock already subscribed.

SHAWANO, WIS.—The Northern Wisconsin Telephone Company has completed the line from Gillette to this city. It will be extended westward soon.

KENDRICK'S CREEK, TENN.—A company has been formed to build a telephone line from Blountville, via Holston Institute, Fordtown, Kendrick's Creek, Fall Branch, and on to Jearaldstown.

BILLERICA, MASS.—John M. Bailey, of this place, has filed a bill for the incorporation of the Globe Telegraph and Telephone Company. Capital stock, $10,000,000.

LOS ANGELES, CAL.—Articles of incorporation of a new telephone company, to be known as the Howmie, have been filed here. Its lines will embrace the following counties: Kern, Santa Barbara, Ventura, San Bernardino, Riverside, Los Angeles and San Diego.

RUSHVILLE, IND.—The local cooperative telephone company, an anti-Bell concern, has secured the right to extend its lines to Carthage, where it has been granted a franchise for a town exchange.

New Corporations.

NEW YORK, N. Y.—The Diamond Light Company has been incorporated to manufacture gas, oil and electric light burners, and burners generally, of all kinds and descriptions. The capital is $1,000,000, and the directors are Oscar Rickelfson and Charles W. Dickel, of White Plains; Henry Biebrecht, Henry T. Thomas, J. Aspinwall Hodge, Jr., Henry S. Thompson, William Grote, Martin Frenzlan and John I. Holly, of New York.

CHICAGO, ILL.—The Decke Tool Company has been incorporated; capital stock, $50,000; to manufacture electric linemen's construction tools. Incorporators, Casper H. Decke, George W. Conover, Morgan R. Kavanaugh, D. E. Gae.

DOWNIEVILLE, CAL.—The Downieville Electric Company has been incorporated. Principal place of business, Downieville. Capital stock, $20,000. William V. Lockwood and R. B. Eilder, of San Francisco; Robert Forbes, Earl McDonald and Adam Denmire, of Downieville, directors.

New Improvement Company.

DENVER, COLO.—The Gold Creek, Nev., Improvement Company, capitalized at $100,000, has filed its articles. It will operate in Elko County, Nevada, but will maintain its principal office in Denver. Its object is to build street railways and tramways, stage and omnibus lines, as well as other means of transportation, waterworks, gasworks, electric light works. The incorporators are Joseph L. Robertson, William H. Paulding, Henry L. Mayhem, Adelbert H. Steele and George L. Hutchings.

Business Troubles.

LAPORTE, IND.—William J. English has been appointed receiver for the Central Bell Telephone Company, of Venezuela.

GENERAL NOTES.

In *McClure's Magazine* for March an illustrated article, based on conversations with Dr. J. C. Bose and Sig. G. Marconi, will describe their recent important discoveries and experiments in telegraphing without wires.

The General Electric Company, of Lynn, Mass., has placed an attachment on the Rutland Electric Light Company's plant for $30,000, and M. F. Francisco, the manager of the Rutland company, placed another attachment for $30,000 on the same plant.

On account of attempting to weigh in to ride "Mrs. Bradshaw" with a saddle that appeared to contain an electric battery (subsequent examination proving that the saddle had contained a battery), and for untruthful statements concerning the same, Jockey McGinniss was recently ruled off the course at New Orleans.

It has been announced that the B. & O. Railroad has awarded contracts for the establishment of an electric lighting plant at Baltimore, Md. Two Thomson-Houston generators and one General Electric will be used, respectively, for arc and incandescent lighting. The company is already operating 12 plants in various places along its lines to furnish light for its own use.

At the annual meeting of the stockholders of the Frankfort, N. Y., Electric Light Company the following directors were elected for the ensuing year: S. S. Richards, G. N. Lehr, W. D. Allen, W. W. Crosby and C. A. Pooler. At a subsequent meeting of the directors the following officers were elected: President, S. S. Richards; vice-president, G. N. Lehr; secretary and treasurer, W. D. Allen.

Kindred.... ...Interests

The Warren Electric and Specialty Company, Warren, Ohio, have issued a very neat little pamphlet in the shape of an incandescent lamp.

The Central Electric Company, Chicago, announce that they are having quite a demand for their new type of station switchboards. These are finished in various designs and are shipped assembled ready for erection, if desired.

The receivers of the E. S. Greeley & Company, New York, are doing a lively business. This large stock is being sold at bargain prices, and many supply houses, and consumers in general, have availed themselves of the low prices that prevail. The large warehouse of the company, at 5 and 7 Dey street, is filled with customers all during business hours.

The Metropolitan Electric Company, Chicago, is having a heavy run on N. I. R wire, of which they are the western agents. They are carrying a large stock of all kinds of insulated wire and cables, so that they are able to fill orders promptly—a very important item to the trade. In addition to this, they are in a position to quote low prices and make prompt delivery on anything in the electric line. Their mammoth catalogue, containing 755 pages and more than 2,250 illustrations, is an encyclopedia of electricity in itself, and is highly valued by electricians and engineers.

A New Firm—Mr. S. C. Munoz, for some years special sales agent for the Heine Boiler Company, and for the past year general sales agent for the Edgemoor boiler, has associated with himself in business Mr. E. C. Darley, late of the Rankin & Fritsch Engine Company, of St. Louis, and previous to that associated with J. P. Witherow, the celebrated steel-works builder, and these two have formed a new firm under the name of Munoz & Darley, with offices in the Rookery, Chicago, Ill. They will act as the general western representatives of the Cahall vertical and Cahall-Babcock & Wilcox boilers, manufactured by the Aultman & Taylor Machinery Company, of Mansfield, Ohio.

The sales of P. & B. insulating compound, armature varnish and tape of the Standard Paint Company, of New York, are constantly increasing. This company are to-day still supplying the same people with P. & B. compound who used it 10 years ago. To those who want something cheaper, the Standard company are prepared to furnish a "universal paint" which gives a very fine, smooth, glossy, even surface, and is said to be far superior to any compound in the market excepting P. & B. The Standard company state they find, as a rule, electricians and manufacturers do not like to experiment with cheap materials, but prefer continuing the use of the old standard P. & B. The company will send to any one interested samples of their products sufficient for all practical tests. Their business since the new year has been particularly large.

Carbon Electrodes—The importance of a suitable carbon electrode for industrial electrolysis becomes evident with the increasing production by electrolytic methods of either chemicals or metals in this country. Mr. Hugo Reisinger, of 38 Beaver street, New York, who is well known to the electrical trade for his "Electra" arc light carbons, has had great success in the introduction of his carbon electrodes, which are used in the electrolytic production of aluminum, copper, chlorate of potash, etc. The carbon electrodes supplied by him are made of pure carbon. They are homogeneous throughout, of the very highest conductivity, and give a very great life. The European factory which Mr. Reisinger represents in this country has the best facilities for turning out large quantities of these carbon electrodes, and, among others, has a running contract to supply all the carbon electrodes used in the world-renowned aluminum factories at Neuhausen, Switzerland.

Metropolitan Street Railway Company Sued.

Ernest F. Bliss, of New York city, has begun suit against the Metropolitan Street Railway Company. Justice Pryor has made an order requiring the Metropolitan company to show cause why it should not be restrained from using the street in front of plaintiff's property on Lexington avenue as a transfer station and committing divers kinds of nuisances in front of his property. The plaintiff claims that the road is operated under void resolutions of Common Council, and also that the use by the company of electricity and cable in front of his house, instead of by cable alone, is unlawful.

Stop-over Privilege at Washington.

A 10-day stop-over at Washington, D. C., is now granted on all through tickets between the East and West, via B. & O. Railroad. Stop-over will also be granted on return journey made on round-trip tickets, within the final limit of such tickets, but not exceeding 10 days. Passengers will deposit their tickets with the ticket agent at B. & O. Railroad station in Washington, who will retain them until the journey is to be resumed, when they will be made good for continuous passage to destination by extension or exchange. This arrangement will doubtless be greatly appreciated by the traveling public, because it will permit the holders of through tickets to make a brief visit to the National Capital without additional outlay for railroad fare.

Electrical Manufacturers, Attention!

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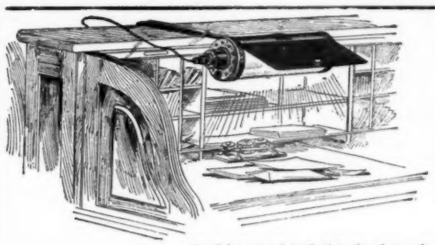

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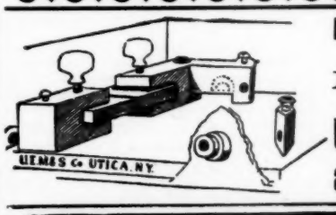

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[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED FEBRUARY 16, 1897.

577,033 Illuminated sign; C. Holland, Millis, Mass.—A frame or holder adapted to be connected with the socket of an incandescent electric lamp and having a pair of jaws, and a sign-plate detachably held by said jaws.

577,037 Electric switch; C. D. Jenney, Indianapolis, Ind.—The switch lever of an electric switch, a pivoted locking device therefor, having a point jointed thereto, and thus enabled to have limited independent movement.

577,071 Electric railway motor; A. Schmid, Pittsburgh, Pa.—A car axle and a motor supported at one side by said axle, a plurality of springs circumferentially arranged around said axle and bearing against the same, a bearing for said motor interposed between the same and the outer ends of said spring and gearing between the motor armature, the bearing and the axle, whereby all of said parts rotate together.

577,077 Electrical warp stop motion for looms; A. C. Shuttleworth, Philadelphia, Pa.

577,081 Electric controller; E. A. Sperry, Cleveland, Ohio—A reversing switch cylinder, brushes engaging therewith, an arc-extinguishing means, a separate inclosing chute for each brush, and means for changing the relation between the brushes and magnet and the switch cylinder.

577,101 Telephone system; W. W. Dean, St. Louis, Mo.—The subscriber's microphone and primary of the induction coil and electro-thermal generator in circuit therewith, a heating coil in proximity to said electro-thermal generator, means for supplying current to said heating coil, and means for controlling the supply of current to said heating coil.

577,102 Party line telephone system; W. W. Dean, St. Louis, Mo.

577,119 Electric brake; E. A. Sperry, Cleveland, Ohio—An electric motor, an auxiliary field coil, and means for automatically connecting the coil in circuit with the motor when the source of supply is interrupted.

577,128 Signal; P. G. Feuerstein, Milwaukee, Wis.—A clock having its dial provided with hour and minute contacts, the clock hands as electric conductors that travel against the contacts on the dial, a switchboard having contacts wired to those aforesaid, electric signal wires, and an electric split plug for connecting switchboard contacts with signal wires.

577,130 Space block for armatures; H. Geisenhoner, Schenectady, N. Y.—A space block for armature cores, consisting of a main portion of cast metal, having recesses or seats for the teeth or projections of the space block, and teeth or projections of strips of metal secured to said cast portions.

577,141 Means for preventing destructive field-magnet discharges; F. Mackintosh, Schenectady, N. Y.

577,148 Binding band for armatures; H. G. Reist, Schenectady, N. Y.—A removable binding band having a number of turns of wire loops formed at the ends of the band and means for securing the ends.

577,158 Electric igniter for explosive engines; W. F. Davis, Waterloo, Iowa.

577,159 Incandescent electric lamp; C. S. Dolley, Hawkins, Pa.—Two plates of mica or their equivalent, an incandescent filament compressed between said plates, a hermetically sealed frame extending around the outer edges of the plates, and wire connections, with the filament thus compressed between the plates.

577,214 Resonant electric circuit; J. S. Stone, Boston, Mass.—A resonant electric circuit containing inductance resulting from the magnetization of independently magnetized paramagnetic material.

577,231 Telephony; W. L. Bradshaw, Cincinnati, Ohio.

577,233 Electrical attachment for barbers' chairs; N. H. Burger, Benzoni, Mich.

577,279 Electric gas-lighter; J. T. Armstrong, London, Eng.

577,282 Electrical battery; E. Burnet, Wigan, Eng.—A cell formed with a socket in its upper opened end, with the electrodes and a tray supporting the electrodes and closely fitting within the socket, and having a flange extending over the walls of the cell to prevent leakage into the tray.

577,307 Fire-extinguishing apparatus; H. F. Maxim, Norfolk, Va.

577,317 Electric furnace; F. J. Patten, New York, N. Y.—Two or more carbon pencils connected through independent electric circuits to a source of electric current, said circuits including a liquid commutator whereby the pencils can be given current singly and in groups, successively, in rotation.

577,329 Electrical casting of metals; N. Slawianoff, St. Petersburg, Russia—Consists in the formation of an electric arc between a metallic rod, which procures the metal to be melted and forms at the same time one of the electrodes of the arc, and the contents of the mold, which forms the other electrode of the arc, and in continuously regulating the electric arc formed.

577,371 Electro-magnetic arc-controlling device; F. J. Patten, New York, N. Y.—The method of imparting reciprocatory movement to an arc between electrodes, which consists in causing the arc to traverse a magnetic field in which the lines of force are transverse to the direction of the arc, and reversing or alternating either the arc-producing current or the magnetic field.

577,373 Method of reproducing photographs; N. S. Amstutz, Cleveland, Ohio.

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The manufacturers of the Packard lamp have always had the reputation of doing something very handsome in the catalogue line, and this reputation has been maintained by the appearance of their catalogue for the season of 1896–1897. This catalogue is a little more pretentious than any of its predecessors, and a goodly number of its pages are devoted to general data on incandescent lamps, and other general information of a very valuable nature. The Electric Appliance Company, of Chicago, have prepared a special discount sheet for this catalogue, giving the present market prices on high-grade Packard lamps, so that the catalogue, when supplied with this discount sheet, makes a complete lamp reference book. It will be sent to the trade on application.

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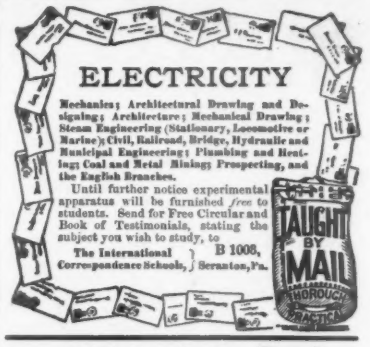
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